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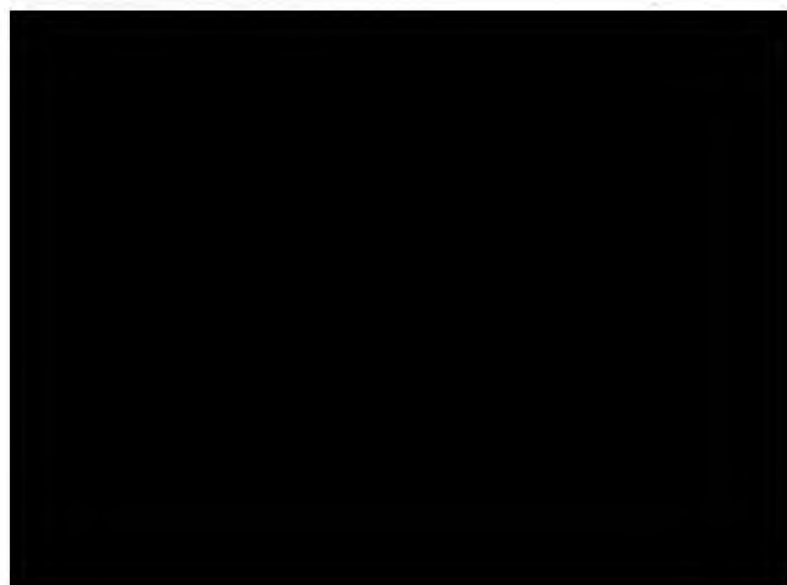
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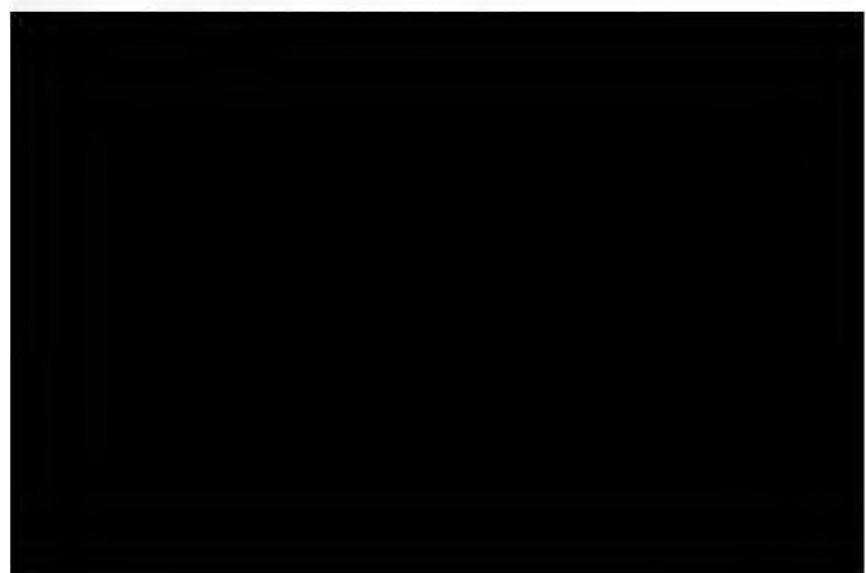
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Royal Institution of Cornwall.

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THE  
CORNISH FAUNA:

A COMPENDIUM OF THE  
NATURAL HISTORY OF THE COUNTY.

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PART I.

THE VERTEBRATE ANIMALS,  
AND  
CRUSTACEANS.

BY  
JONATHAN COUCH, F.L.S., &c.

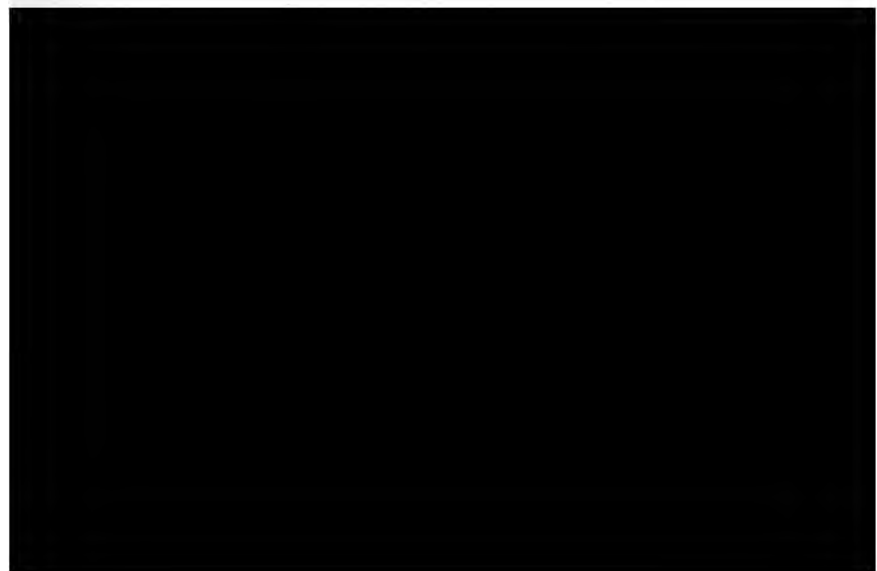
WITH REVISIONS AND LARGE ADDITIONS BY

J. BROOKING ROWE, F.L.S., (Mammalia); THOMAS CORNISH, (Reptilia and Pisces);  
E. H. RODD, (Aves); and C. SPENCE BATE, F.R.S., (Crustaceans).

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TRURO:  
LAKE & LAKE, PRINCES STREET  
1878.

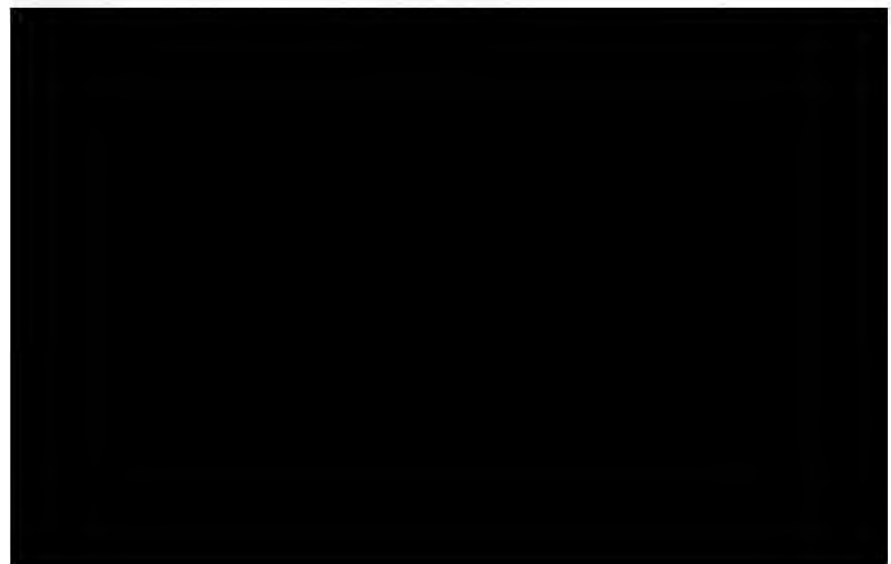
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## INTRODUCTORY NOTE.

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Forty years have elapsed since the publication of a "Cornish Fauna," a compendium of the Natural History of Cornwall, and a convenient companion to the Museum of the Institution under whose auspices it was produced. Lapse of time, and a large multiplication of observers have added much to what was then known, and it is gratifying to find that the constant wish of Jonathan Couch is now fulfilled in a much needed second edition of the first part. With such a desire he collected largely, and even went so far as to write the following preface, which was found among his papers, and forwarded to the editor by his son, Mr. T. Q. Couch, of Bodmin. It will be seen that Mr. Couch contemplated adding to the original design, an account of such extinct animals as have had comparatively late entombment in our diluvial soils, gravels, drift, or cavern accumulations, and this still remains a work to be done.



## PREFACE.

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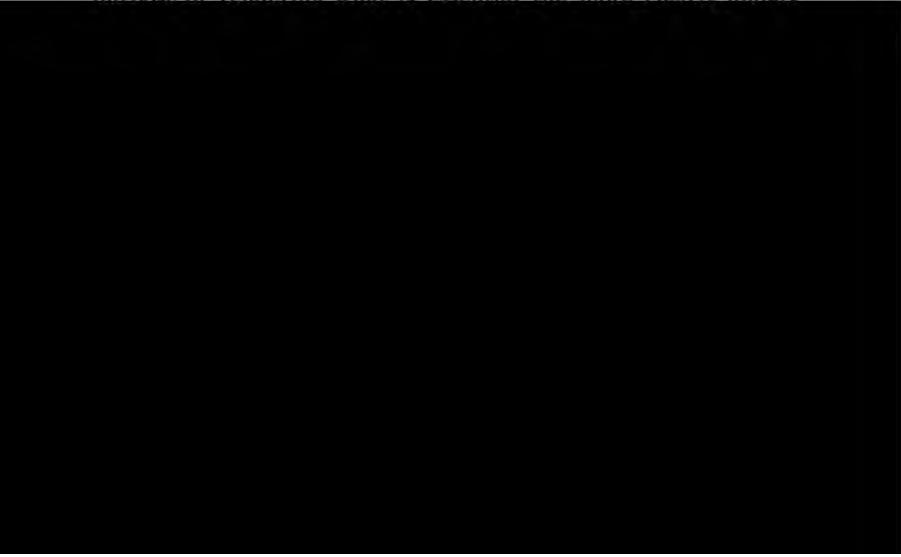
When the first edition of the Cornish Fauna was published, it was judged necessary to make an apology for its production, by offering some explanation of the advantages to be obtained from the study of the natural productions of a limited region towards the progress of science, and the more general understanding of the works of God. But it is highly gratifying to find that such an explanatory apology is now no longer necessary. It is admitted on all hands that such a work is useful. By the scientific naturalist it is confessed that many of his most valuable contributions towards the progress of knowledge have been poured into the common stock from this source; and the local resident has felt a pleasure in discovering that he may become acquainted with the natural objects which surround him, by consulting a book of small size, and which will direct his enquiry after further information, without rendering it necessary for him to wade through a multitude of volumes, without clearly understanding what he is searching for. To every one it must be a matter of interest to possess some amount of information with regard to the number and distribution of the animal creation of his own district; while the men of more general science are also instructed in what has only of late been valued as it deserves, the geographical distribution of living beings on the earth and in the waters. Akin to this is the influence which local circumstances exert on the form and colour or habits of species known to exist also in other lands; and this, with the employments which arise from the visits of fish and birds, as also the opinions and superstitions to which close observation on the one hand, and ignorance on the other, have given rise, are properly the

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subject of record in a local work on natural history, although they may with propriety be shut out from books which treat of the science in its wider range.

Whether we regard its geographical position, at the extremity of the kingdom, and surrounded so much by the sea as almost to partake of the character of an island; or whether we take into account the irregularity and diversity of its surface and soil, with the peculiarity of its climate and prevailing winds, there is no county in England that presents such variation of aspect from all besides, as does the county of Cornwall; and as the ocean which surrounds its in general rocky coasts is to be considered as a portion of itself, and the depths of the billows are constantly presenting to the observer some new object of animal life, it will be long indeed, before the curiosity of an inquirer will be satisfied, or the subject can be regarded as exhausted. But here again a local Fauna will be found to hold an important place in the estimation of the student; for it will present to him a summary of the species already known, with their varieties of occurrence, and the circumstances under which they have hitherto been obtained; and as it is important that in such a work as this nothing shall be included that is not well authenticated, and that as much as possible by the writer in his proper person, or from the information of such observers as he can confidently trust, so it should be understood that nothing is introduced into the pages of the work that has already obtained a place in general works of science, unless it shall be indispensable for the purpose of rendering what is essential the more clearly under-



the progress of human advancement and industry, as others remain among us only by sufferance, or for our pleasure; but most of the former, have left some marks of their presence, either at least in the names of places where formerly they were found, or in the history of events with which they were connected; and as some of their remains are at times dug up from the places in which they had long been buried, it forms a necessary part of our subject to preserve some record of these fragments in connection with the place, and to associate them in our remembrance with those species which were their companions in ages long gone by, but which from causes altogether unknown have not perished with them.\* We would not deny the ancient existence of many species because they have not left any diluvial remains behind them; but there are undeniable proofs that the badger, among others, which continues to maintain its station among us in spite of persecution, was also an inhabitant of Britain at a time when there roved over our hills a very different race of animals from any we now see, or it would be pleasant or safe to meet.

At the time when the Cornish Fauna of the first edition was written, the number of observers in Cornish natural history was few, and the materials for reference in ascertaining the names of species scanty, but it is a great pleasure to remark that a great improvement has since then taken place in both respects. The series of books on the science, published by Mr. Van Voorst, has left little to be desired in the latter respect; and besides that, they have had, further, the good effect of increasing the number of students of nature, and bringing them into closer acquaintance with others, and thus benefited their enquiries by the mutual aid they have obtained from each other's labours. It is with much pleasure that the author acknowledges the assistance he has received from the communications of several of those, his esteemed friends: the names of whom will be found in the course of the following pages, as authorities for several of the facts he has given, but it is with feelings of sorrow he adds, that some of them, greatly valued, have been removed from all that caused joy or sorrow on earth; and others have been far removed by the casualties of life, either into situations

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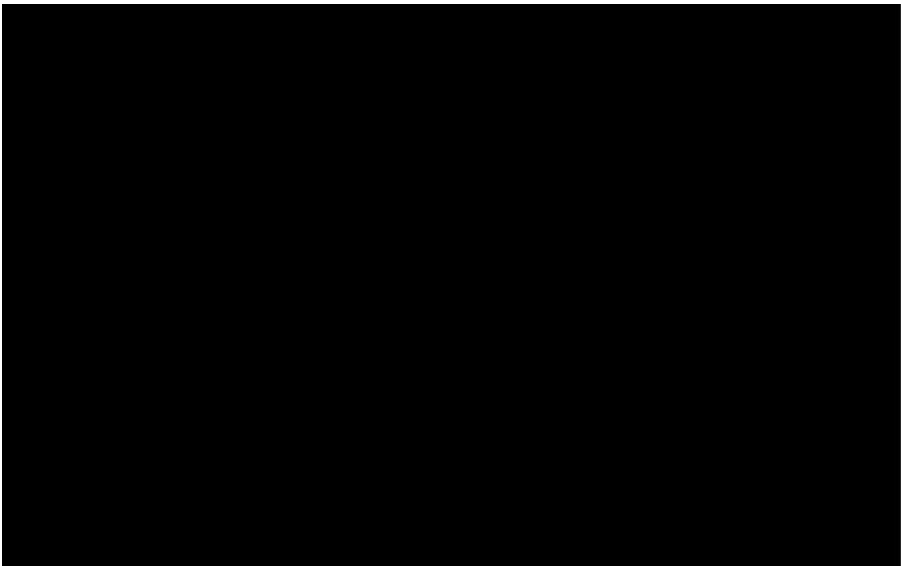
\* See Introductory note, p. iii.

in which other cares are made to occupy attention, or into more distant parts of our island or the world, beyond the reach of that once intimate conversation from which at once both pleasure and instruction flowed.

Absent or dead—still let a friend be dear ;  
A sigh the absent claims—the dead a tear.

but in any case it becomes the duty, as it is the gratification of the author, to record the names of those from whom many of his facts have been obtained.

JONATHAN COUCH.



# A CORNISH FAUNA.

BY THE LATE JONATHAN COUCH, F.L.S., &c.

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## VERTEBRATA—MAMMALIA.

*Revised and corrected by J. Brooking Rowe, F.L.S., Fellow of the Society of Antiquaries &c.,*

AT the request of the Council of the Royal Institution of Cornwall, I have revised that part of the Fauna relating to the Mammalia. The author included the Domestic Animals in the original work, but in this edition it has been thought well to omit them, as they are not true members of the Fauna. The parts within inverted commas are in Mr. Couch's own words.

### CHIROPTERA. (BATS.)

"The Cornish name of these animals is Ary-mouse or Rery-mouse, from the Saxon word "ræran" "aræran" to raise or be lifted up, that is to fly."

Since the first edition of the Cornish Fauna was published, much attention has been paid to this interesting order. The investigations of Kuhl, as well as those of Count Keyserling, and Professor Blasius, while productive of much information, have not resulted in confirming the belief, generally entertained some years since, that further research would increase the number of European species. The last edition of Bell's British Quadrupeds has reduced the number of indigeneous species from seventeen to fourteen. Further information will be found in the two editions of Bell's Quadrupeds, Lord Clermont's "Guide to the Quadrupeds and Reptiles of Europe," 1859, and the "Naturgeschichte der Säugethiere Deutschland" of J. H. Blasius, 1857.

#### GREAT BAT.—*Vespertilio noctula*.

Jenyns, p. 23; Bell, p. 12, 2nd edition, p. 17; Blasius, p. 53; Clermont, p. 8.

In the county generally, this species may be said to be rare, but in some localities it appears to be frequently met with

especially on the Devonshire border. At Falmouth Mr. Cocks says "not uncommon." With the exception of *V. Murinus* it is our largest British species.

PIPISTRELLE.—*Scotophilus pipistrellus*.

Jenyns, p 24; Bell, p 23, 2nd edition, p 34; Blasius, p 61; Clermont, p 15.

"This is our commonest species, and flies at all seasons of the year if the thermometer be not much below 50°. It awakes in a few hours after the weather has become mild, and is not uncommonly seen abroad in the middle of a fine day." The *V. pygmaeus* of Leach, (Bell, 1st ed., p. 31) is the young or a small individual of this species. Some references by Mr. Couch on the flight of this species in the day-time, are recorded in the *Zoologist*, 1843, p. 343; and in the same periodical, 1853 and 1854, pp. 3936 and 4157, will be found some interesting observations by him on the habits of some species of bats.

REDDISH-GREY BAT.—*Vespertilio Nattereri*.

Jenyns, p 23; Bell, p 42, 2nd ed., p 54; Blasius, p 88; Clermont, p 10.

Two individuals of this species were obtained by Mr. Couch, from Looe, in Sept., 1852, *Zool.*, 1853, p. 3937. I can find no other instances of the occurrence of this bat in either the peninsula or channel province.

DAUBENTON'S BAT.—*Vespertilio Daubentonii*.

Jenyns, p 26; Bell, pp 45, 47, 2nd ed., p 60; Blasius, p 98; Clermont, p 20.

Mentioned by Mr. Couch as *Vespertilio emarginatus*, *Zool.*, 1853, p. 3942, and *Zool.*, 1854, p. 4157, but without giving the date of capture or the locality. The specimen weighed 70 grains and

GREATER HORSE-SHOE BAT.—*Rhinolophus ferrum-equinum*.

Jenyns, p 19; Bell, p 18, 2nd ed., p 89; Blasius, p 31; Clermont, p 4.

Much rarer in Cornwall than the smaller species next to be mentioned. In Devonshire the reverse is the case.

LESSER HORSE-SHOE BAT.—*Rhinolophus hipposideros*.

Jenyns, p 20; Bell, p 28, 2nd ed., p 96; Blasius, p 29; Clermont, p 4.

Common in some localities. "In the neighbourhood of Tre-lawny house this species abounds, almost to the exclusion of every other." Falmouth, Dr. Bullmore.

## INSECTIVORA. (INSECT EATERS.)

HEDGEHOG.—*Erinaceus Europæus*.

Jenyns, p 19; Bell, p 76, 2nd ed., p 102; Blasius, p 152; Clermont, p 46.

Called in some place in Cornwall the Hedge Boar and Sow. "The female is of a much more timid character than the male, and in captivity has been known to devour her own young." Common.

MOLE.—*Talpa Europæa*.

Jenyns, p 17; Bell, p 85, 2nd ed., p 115; Blasius, p 109; Clermont, p 48.

"In Cornwall generally the Want. Moel, in Welsh, signifies a little hill, and a moel implies a small tumour, but mould also means the earth or soil, and mould-warp, another name of the animal, implies one that bends or works the soil. The Want is one that disappears, as to want is to be absent, to disappear." Common. A mole catcher, in six winter months, took twelve hundred moles in the county.

COMMON SHREW.—*Sorex Vulgaris*.

Jenyns, p 17; Bell, p 109, 2nd ed., p 141; Blasius, p 129; Clermont, p 37. Common.

LESSER SHREW.—*Sorex pygmaeus*.

Bell, 2nd ed., p 148a; Blasius, p 133; Clermont, p 38.

This species, although not hitherto recorded as occurring in Cornwall, will be probably found there, as it is generally distributed throughout the country.

WATER SHREW.—*Sorex fodiens*.

Jenyns, p 18; Bell, p 155, 2nd ed., p 149; Blasius, p 120; Clermont, p 40. Common. *S. remifer* is a permanent variety of this species.

**CARNIVORA. (FLESH EATERS.)****BADGER.—*Moles taxus*.**

Jenyns, p 10; Bell, p 122, 2nd ed., p 158; Blasius, p 237; Clermont, p 59.

"The word badger was anciently used as equivalent to trapper or pedler, that is one that walks on his feet, which is applicable especially to this animal, that was placed by Linneus in his Genus *Ursus*, and distinguished from such as walk only on their toes. Ray Syn, p. 185, who gives an account of its structure, omits to mention that its jaw cannot be displaced from the sockets but by breaking the bone, a character not so decidedly found in any other British animal." It is generally common, and in a locality in the neighbourhood of Falmouth, Dr. Bullmore says that it is found in considerable numbers.

**OTTER.—*Lutra vulgaris*.**

Jenyns, p 13; Bell, p 129, 2nd ed., p 167; Blasius, p 237; Clermont, p 59.

"By far the greatest portion of these creatures, in Cornwall, derive their food from the sea, where they may be seen diving for fish even where the waves are very tempestuous. Several instances are known of their being drowned in crab-pots, into which they had entered in search of prey and had not afterwards been able to find the opening." It is common in the many caves around the coast.

**COMMON WEASEL.—*Mustela vulgaris*.**

Jenyns, p 12; Bell, p 141, 2nd ed., p 182; Blasius, p 231; Clermont, p 55.

Common.

**STOAT.—*Mustela erminea*.**

Jenyns, p 13; Bell, p 148, 2nd ed., p 191; Blasius, p 228; Clermont, p 56.



fur was in high esteem) may be ascribed to the change of habits in society, by which the common use of mineral coal was introduced among farmers. Before that time a large number of pollard trees were permitted to grow in the neighbourhood of *town-places* or farm yards, for the purpose of supplying the house with fuel, and the cavities which most of them contained afforded a safe shelter to these, and the others of the weasel tribe. When such fuel became of less importance these hollow trees were gradually cut down, or suffered to fall, to the great diminution of the numbers of the weasel tribe." Report Royal Cornwall Polytechnic Society, 1854, pp 25, 26.

FOX.—*Vulpes vulgaris*.

Jenyns, p 14; Bell, p 252, 2nd ed., p 225; Blasius, p 191; Clermont, p 62.

"Common, especially in cliffs near the sea."

CARNIVORA PINNIPEDIA. (SEALS.)

COMMON SEAL.—*Phoca vitulina*.

Jenyns, p 15; Bell, p 263, 2nd ed., p 240; Blasius, p 248; Clermont, p 73.

Not frequently found. Otters are often mistaken for these animals. One Whitsand Bay, 1861.

GREY SEAL.—*Halichærus gryphus*.

Bell, p 278, 2nd ed., p 262; Blasius, p 256; Clermont, p 80.

"Mr. Bell's figure and description go far in deciding this to be the species taken in a net near Padstow, in 1832, and of which some account is given in London's Mag. Nat. Hist., Vol. 7, p 208."

RODENTIA. (RODENTS.)

SQUIRREL.—*Sciurus vulgaris*.

Jenyns, p 29; Bell, p 291, 2nd ed., p 276; Blasius, p 272; Clermont, p 116.

Common in some parts of the county, rare or unknown in others.

DORMOUSE.—*Myoxus avellanarius*.

Jenyns, p 30; Bell, p 295, 2nd ed., p 281; Blasius, p 297; Clermont, p 122.

Frequently called "Dormouse." Common.



HARVEST MOUSE.—*Mus minutus*.

Jenyns, p 29 ; Bell, p 299, 2nd ed., p 286 ; Blasius, p 323 ; Clermont, p 116.  
Common.

LONG-TAILED FIELD MOUSE.—*Mus sylvaticus*.

Jenyns, p 30 ; Bell, p 305, 2nd ed., p 93 ; Blasius, p 322, Clermont, p 101.  
Common.

COMMON MOUSE.—*Mus musculus*.

Jenyns, p 31 ; Bell, p 308, 2nd ed., p 297 ; Blasius, p 320 ; Clermont, p 100.  
Common.

BLACK RAT.—*Mus rattus*.

Jenyns, p 32 ; Bell, p 311, 2nd ed., p 302 ; Blasius, p 317 ; Clermont, p 98.  
Scarce generally, but occasionally found in some localities.  
Not uncommon at Falmouth.

BROWN RAT.—*Mus decumanus*.

Jenyns, p 32 ; Bell, p 315, 2nd ed., p 308 ; Blasius, p 313 ; Clermont, p 97.  
Common. *M. rattus* and *M. decumanus* are the only British species. *Intermedius* and *domesticus* are apparently slightly varying individuals.

WATER VOLE.—*Arvicola amphibius*.

Jenyns, p 33 ; Bell, p 321, 2nd ed., p 316 ; Blasius, p 344 ; Clermont, p 83.  
Common.

FIELD VOLE.—*Arvicola agrestis*.

Jenyns, p 33 ; Bell, p 325, 2nd ed., p 323 ; Blasius, p 369 ; Clermont, p 90.  
Common.

RED FIELD VOLE.—*Arvicola glareolus*.

Bell, p 330, 2nd ed., 327 ; Blasius, 337 ; Clermont, p 91.

Dr. Bullmore says "not uncommon," and Mr. W. P. Cocks gives two localities near Falmouth, where it is found.

RABBIT.—*Lepus cuniculus*.

Jenyns, p 35; Bell, p 428, 2nd ed., p 343; Blasius, p 427; Clermont, p 129.

Common. "A black variety is sometimes seen, but this peculiarity is not propagated as in the white hare above mentioned."

## CETACEA MYSTACOCETI.

COMMON RORQUAL.—*Balenoptera musculus*.

Jenyns, p 47; Bell, p 520, 2nd ed., p 343; Blasius, p 534; Clermont, p 160.

"Specimens of the Razor-back are seen upon the Cornish coast every year feeding upon the smaller gregarious fishes. A specimen was cast up at Falmouth, in 1863, and the skeleton is now, or was recently, at the Alexandra Palace, Muswell Hill. Another at Plymouth, in 1831, which had been observed frequenting the Cornish coast in pursuits of herrings for some time previously.

SIBBALD'S RORQUAL.—*Balenoptera sibaldi*.

Bell, 2nd ed., p 402.

"Rare." One at Cadgwith, near the Lizard. It was 65 feet long, 24 inches in circumference, and the breadth of the caudal fin 13 feet. Dr. Bullmore.

BEAKED WHALE.—*Balena rostrata*.

Bell, 2nd ed., p 411; Jenyns, p 47; Blasius, p 535.

A specimen brought into Polperro, by the mackerel boats, May, 1850. Dr. Bullmore.

## ODONTOCETI.

SPERM WHALE.—*Physeter macrocephalus*.

Bell, 2nd ed., p 415; Blasius, p 532; Clermont, 157.

A whale, supposed to be of this species, is sometimes seen off the Cornish coasts, says Mr. Couch, sailing rapidly along at a uniform elevation in the water, with its slender but elevated fin above the surface, while the body is concealed below.

HUMPED BLOWER.—*Physeter polycyphus*.

As to this species I can only quote what is said by Mr. Couch. "I have unfortunately omitted to note the proper reference to any authority for the use of the trivial name here given, and which I had an opportunity of verifying, in a volume belonging to the Library of the Zoological Society of London. One specimen ran itself ashore in pursuit of small fish several years since; and another was seen and minutely described to me by an intelligent

fisherman, but it would appear that the number of humps on the back is variable. It is probably the *Balæna monstrosa*, Ruyssh's Theat. Anim., vol I. tab 41."

DOLPHIN.—*Delphinus delphis*.

Jenyns, p 40; Bell, p 463, 2nd ed., p 462; Blasius, p 516; Clermont, p 146.

Common. Visits Mount's Bay in large shoals during the summer.

GRAMPUS.—*Delphinus orca*.

Jenyns, p 42; Bell, p 477, 2nd ed., p 445; Blasius, p 522; Clermont, p 150.

Occasionally captured.

PORPOISE.—*Phocæna communis*.

Jenyns, p 41; Bell, p 473, 2nd ed., p Blasius, p 520; Clermont, p 149.

Common. "The sniffer of the Cornish fisherman. It is sometimes caught in drift nets, and I have known it take a bait, though it commonly proves too strong for the line. The rolling motion of this and some other of the smaller species is caused by the situation of the nostrils on the anterior part of the top of the head, to breathe through which the body must be placed in somewhat of an erect posture from which to descend, it passes through a considerable portion of a circle. They rarely congregate into a herd, like the other Delphini, and commonly no more than a pair is seen together."

Risso's GRAMPUS.—*Grampus griseus*.

Bell, 2nd ed., p 450; Blasius, p 523; Clermont, p 152.

A beautiful specimen of this cetacean, an adult female 10 feet

## VERTEBRATA—AVES.

*Revised and corrected by E. H. Rodd.*

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THE following is a statistical summary of the birds at present included in the Cornish Fauna. It may be remarked that Cornwall and the Land's End locality, including the Scilly Isles, have been singularly fortunate in rendering specimens of our rarer birds, and this may be in a great measure attributed to its extreme westerly position, and other influences which climate and other causes arising from its maritime and peninsular characters are calculated to aid.

### RAPTORES. (BIRDS OF PREY.)

Spotted Eagle, *Aquila nœvia*, Trebartha and Carnanton. One specimen killed at Trebartha in 1861, and another shortly after at Carnanton, both in immature plumage.

White-tailed Eagle, *A. albicilla*, sometimes seen on the sea-coast. Osprey, *Pandion Haliaetus*, several examples obtained. One example killed at Scilly in Sept., 1849.

Greenland Falcon, *F. Greenlandicus*; very rare in the southern parts of England: one killed at the Lizard, another at Port Eliot, in St. Germans.

Peregrine Falcon, *F. peregrinus*; frequently observed at Scilly, where they breed.

Hobby, *F. subbuteo*; rare: summer visitor.

Red-footed Falcon, *F. rufipes*; rare. Wembury, near Plymouth, within a few miles of Cornwall.

Merlin, *F. Æsalon*; winter visitor: not uncommon. Frequents the outskirts of moors, bordering on cultivated land. The old male with a light blue back is the Stone Falcon of Bewick.

Kestrel, *F. tinnunculus*; generally distributed.

Sparrow-hawk, *A. nisus*; generally distributed: the female of this species is at least one-third larger than the male.

Kite, *Milvus forficatus*; lately obtained from Trebartha. This species has been almost exterminated in the west of England: two examples in the Truro Museum of the Cornish Institution, labelled as Cornish.

Common Buzzard, *Buteo vulgaris*; the most common of the larger *Raptores*. It has been observed that an extensive and regular migration of the common buzzard takes place in the autumn, when large numbers are seen together in the moors in the eastern part of the county, and throughout the county to Scilly.

Rough-legged Buzzard, *B. Lagopus*, Cornish; once seen on Bodmin moors.

Honey Buzzard, *B. apivorus*. The honey buzzard has lately been captured in Cornwall. Two specimens obtained from Carclew, and one from Trereife, near Penzance. This species is remarkable for having the lore covered with small feathers, which in the other *Raptores* is nearly bare.

Marsh Harrier, *Circus rufus*; rare throughout the whole county.

Common Harrier, *C. cyaneus*; not a numerous species: a proportion of 4-5ths of the examples captured have been in the "ringtail" or brown plumage.

Montagu's Harrier, *C. cineraceus*; not rare: observed at Scilly.

There are four distinctions in this species from the last: viz.,—its inferiority of size; the black bars on the secondary feathers of the wing of the male; greater length of wing; and in the under parts of the adult male having longitudinal rufous streaks, whilst the immature males and females have

the under parts of an uniform rufous brown, characters not



## INSESSORES. (PERCHERS.)

Great Grey Shrike, *Lanius excubitor*; rare: occasional visitant in some parts of England, and generally, though not always, in the winter. One killed at Gweek, near Helston.

Lesser Grey Shrike or Rose-breasted Shrike, *Lanius minor*, Cornish; Scilly Isles. A specimen of this Shrike was killed at Scilly in the month of November 1851. (See Corr. and notices in "Zoologist" for the year 1867. See also further particulars of this new British species in Gould's "Birds of Great Britain," Article *L. minor*.)

Red-backed Shrike, *L. collurio*; summer visitant, not numerous, and at uncertain intervals; nest large for the size of the bird, and much exposed.

Woodchat Shrike, *L. Rufus*; very rare: an adult bird caught in a boat, near Scilly. In the autumn of 1849 several examples of the young of the year were captured on the Scilly Isles.

Spotted Flycatcher, *Muscicapa grisola*; generally distributed.

Pied Flycatcher, *M. luctuosa*; not recorded as a Cornish species till the autumn of 1849, when one was captured at Alverton, Penzance; others have since been taken at Scilly.

Red-breasted Flycatcher, *M. parva*; Carwythenack, Constantine, and Scilly. (See Gould's "Birds of Europe.")

Common Dipper, *Cinclus aquaticus*; East Cornwall: frequents rocky mountain streams.

Missel Thrush, *Turdus viscivorus*; generally distributed.

White's Thrush, *T. Whitei*. A specimen of this rare thrush, in very perfect plumage, was killed near Trewithen, in Probus, a short time since.

Fieldfare, *T. pilaris*; winter visitant: after severe frost there is always a great accession of numbers throughout this and the western counties, from their retreating as far southward and westward as possible for a less rigorous climate; a short duration of severe frost appears to prostrate the powers of this and the following species.

Redwing, *T. iliaca*, Cornish; winter visitant. (See previous remarks on the fieldfare.)

Song Thrush, *T. musica*; generally distributed.

Blackbird, *T. vulgaris*; generally distributed.

Ring Ouzle, *T. torquato*; summer visitant. More common on the eastern moors, where they breed.

Golden Oriole, *Oriolus galbula*; not uncommon in the spring months, and observed nearly every year at Scilly.

Hedge Sparrow, *Accentor modularis*; generally distributed.

Redbreast, *Erythaca ruticilla*; generally distributed.

Redstart, *Phenicura ruticilla*; very rare westward of Exeter.

At Trebartha woods, in the parish of North-hill, nest and eggs were also found and secured, and specimens of the bird.

Seen during the autumnal migration. at Scilly.

Black Redstart, *P. Tithys*; not uncommon in the winter months in immature plumage. Observed at Scilly.

Stonechat, *Saxicola rubicola*; generally distributed.

Whinchat, *S. rubetra*; rare and local; eastern moors; occasionally in the neighbourhood of Penzance.

Wheatear, *S. cenanthe*; summer visitant.

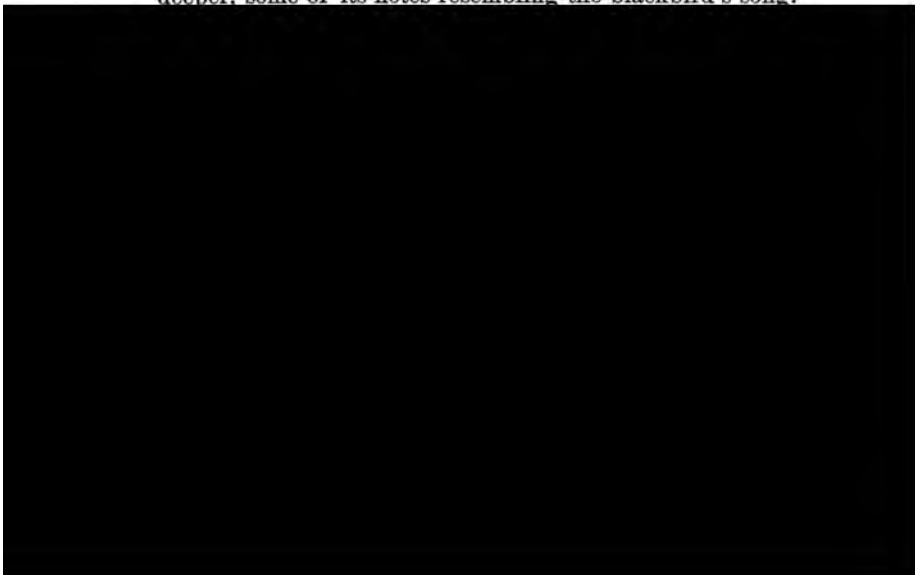
Grasshopper Warbler, *Salicaria locustella*; summer visitant; rare.

Sedge Warbler, *S. phragmites*; summer visitant.

Reed Warbler, *S. arundinacea*; several captured at Scilly, with other summer migrants, in the autumn of 1849.

Blackcap Warbler, *Curruca atricapilla*; local; summer visitant. Song sweet, wild, and full.

Garden Warbler, *C. hortensis*, Cornish; summer visitant; eastern part of the county. Its habits, food, song, nest and eggs, and general character, approach very near the former species:—song rather more hurried, and sometimes garulous in expression, but the quality of voice quite equal, and the tones deeper, some of its notes resembling the blackbird's song.



Chiff-chaff, *S. rufa*; summer visitant: generally distributed. Some few remain throughout most winters, and have been heard chirping, in mild, open weather, in December and January.

Dartford Warbler, *Melizophilus provincialis*; much more common than formerly.

Gold-crested Regulus, *R. cristatus*; generally distributed.

Fire-crested Regulus, *R. ignicapillus*; not uncommon; Penzance, Gwennap, &c.

Great Tit, *Parus major*; generally distributed.

Blue Tit, *P. caeruleus*; generally distributed.

Cole Tit, *P. ater*; not uncommon in woods.

Marsh Tit, *P. palustris*; not uncommon, and not confined to marshes.

Long-tailed Tit, *P. caudatus*; rather local: found in small families throughout the winter.

Bearded Tit, *Calamophilus biarmicus*; very rare.

Bohemian Waxwing, *Bombycilla garrula*; occasional winter visitant.

Pied Wagtail, *Motacilla yarrellii*; generally distributed.

Continental Pied Wagtail, *M. alba*; not uncommon in the spring months.

Grey Wagtail, *M. boarula*; winter visitant in the south of England: generally distributed. Some few remain throughout the summer in Cornwall, and breed.

Grey-headed Wagtail, *M. neglecta*; rare: Marazion Green.

Ray's Wagtail, *M. flava*; seen for a few days on their first arrival, and again in the autumn, on their return.

Tree Pipit, *Anthus arboreus*; summer visitant: very common in the eastern parts of the county, in the summer months: rare in west Cornwall. Song louder and very superior in quality to the titlark.

Meadow Pipit, *A. pratensis*; generally distributed.

Rock Pipit, *A. aquaticus*; generally distributed on our rocky beaches.

Tawny Pipit, *A. campestris*; Scilly Isles.

Richards' Pipit, *A. Richardi*; (length  $7\frac{1}{2}$ , not  $6\frac{3}{4}$ , ins.: see Yarrell), Cornish; rare.

Sky Lark, *A. arvensis*; generally distributed.



Crested Lark, *A. cristata*. The discovery of this species in this district took place at about the period of the publication of the 1st supplemental number to Yarrell's History of Birds, the bird not having been recognized as British at the time of the publication of his work.

Wood Lark, *A. arborea*; local.

Short-toed Lark, *A. brachydactyla*; very rare; a specimen shot at Scilly on September 23rd, 1854.

Snow Bunting, *Emberiza nivalis*; not uncommon in the autumn months.

Common Bunting, *E. miliaria*; generally distributed.

Black-headed Bunting, *E. schæniculus*; not uncommon in marshes where bushes grow.

Yellow Bunting, *E. citrinella*; generally distributed in every hedge-row.

Cirl Bunting, *E. cirius*; not uncommon.

Ortolan Bunting, *E. hortulana*; very rare: one specimen was killed on a wall at Trescoe Abbey, Scilly, in 1851.

Chaffinch, *Fringilla cælebs*; generally distributed.

Mountain Finch, *F. montifringilla*; winter visitant in severe weather.

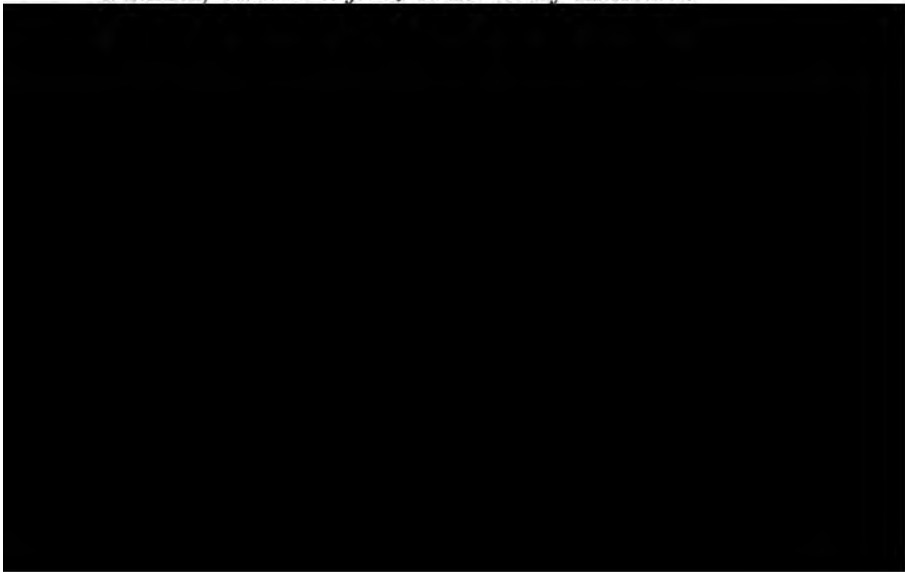
Tree Sparrow, *F. montana*; very rare.

House Sparrow, *F. domestica*; generally distributed.

Greenfinch, *F. chloris*; generally distributed.

Hawfinch, *Coccothraustes vulgaris*; winter visitant: appears singly, and sometimes in small flocks, at uncertain intervals.

Goldfinch, *Carduelis elegans*; rather locally distributed.



- Rose-coloured Pastor, *Pastor roseus*; several examples have been obtained in Cornwall, and an adult bird from Scilly.
- Chough, *Corvus graculus*; much less common than formerly; sparingly observed in different localities on the coast.
- Raven, *C. corax*; generally distributed.
- Carriion Crow, *C. carone*; generally distributed.
- Hooded Crow, *C. cornix*; rare: occasional visitant. Formerly abundant on Marazion Green, whence it derived one of its synonyms of "Market-Jew Crow"
- Rook, *C. frugelegus*; generally distributed.
- Jackdaw, *C. monedula*; generally distributed.
- Magpie, *C. pica*; generally distributed.
- Jay, *C. glandarius*; common in the woodland districts of the county.
- Green Woodpecker, *P. viridis*; very common in the eastern woodlands, and more frequent than formerly in the west of Cornwall.
- Great spotted Woodpecker, *P. major*; rare: seen in the eastern woodlands.
- Lesser Spotted Woodpecker, *P. minor*; rare. The note of this bird exactly resembles the roosting call of the common blackbird.
- Wryneck, *Yunx torquilla*; rare in all parts of the county: occasionally observed in the neighbourhood of Penzance in the autumn only, near the coast, probably preparing for migration. Some specimens obtained at Scilly, with other migratorial birds, in the autumn.
- Common Creeper, *Certhia familiaris*; commonly distributed where large trees grow.
- Wren, *Troglodytes vulgaris*; Cornish; generally distributed.
- Hoopoe, *Upupa epops*; examples of this bird are generally to be obtained every spring.
- Nuthatch, *Sitta Europea*; very common in the eastern woodlands, becoming more rare westward.
- Cuckoo, *Cuculus canorus*; generally distributed in the summer months.
- Yellow-billed American Cuckoo; on the authority of the notice in Yarrell's work, a very rare British bird.
- Roller, *Coracias garrula*; two or three captured near the Land's End.

Bee-eater, *Merops apiaster*. The only instances of the occurrence of this bird in this county was the capture of a flock of twelve near Helston, in 1828, and which came into the possession of the late George Borlase, Esq., of that place; and, on the authority of Mr. Couch, of Polperro, four specimens were seen in the parish of Madron.

Kingfisher, *Alcedo hispidus*; generally observed on the sea-coast; nowhere common, but generally observed, from its attractive metallic colours.

Swallow, *Hirundo rustica*; summer visitant: universally distributed.

Martin, *H. urbana*; summer visitant: universally distributed.

Sand Martin, *H. riparia*; summer visitant: generally distributed in the neighbourhood of, and within reach of sandbanks.

Common Swift, *Cypselus apus*; locally distributed.

Alpine Swift, *C. Alpinus*; very rare: one example taken near the Lizard, and afterwards preserved by Mr. Jackson, of Looe. One specimen of the Alpine swift in adult plumage was captured in the parish of Mylor, in the summer of 1859.

Nightjar, *Caprimulgus Europæus*; locally distributed.

#### RASORES.

Ring Dove, *Columba palumbus*; generally distributed.

Stock Dove, *C. ænas*; rare in the western counties: two specimens obtained from Scilly a few years since.

Rock Dove, *C. livia*; found occasionally in the cliffs on the south coast of Cornwall, about Looe and Polperro.

The Dove, *C. palumbus*, summer visitant, occasionally seen in the

ovarium more or less developed, and one female in particular from the naked state of the breast and belly gave strong evidence of incubation. (See "Zoologist" for 1863.)

Partridge, *Perdix cinerea*; universally distributed.

Common Quail, *C. vulgaris*; rare.

Great Bustard, *Otis tarda*; one observed and afterwards captured on Goonhilly, Lizard district: this proved to be a female. Another example of the great Bustard was obtained from the immediate neighbourhood of St. Austell, near Polgooth mine, in the month of January, 1854.

Little Bustard, *O. Tetrax*; rare: two specimens (females) of the little Bustard were brought to Penzance and sold to the poulterers in December, 1853.

Great Plover, *Edicnemus crepitans*; occasionally observed in the Land's-end district in the winter months, and one or more examples captured every year.

Golden Plover, *Charadrius pluvialis*; generally distributed in the winter months.

Dottrell, *C. morinellus*; rare: open moors and sheepwalks; an inland species.

Ringed Plover, *C. hiaticula*; Cornish; generally distributed along our sea-shores.

Kentish Plover, *C. Cantianus*; a specimen obtained from Marazion beach.

Little Ringed Plover, *C. minor*; very rare as a British bird. A young bird of the year, corresponding in every particular with the figure in Gould's "Birds of Europe," was shot near the higher pond of Tresco, Scilly, in October, 1863.

Grey Plover, *Squatarola cinerea*; occasional winter visitant, especially after severe weather.

Lapwing, *Vanellus cristatus*; locally distributed.

Turnstone, *Streptilas interpres*; observed in the spring and autumn migrations.

Sanderling, *Calidris arenaria*; not a very numerous species: specimens in winter and summer plumage frequently obtained.

Oyster-catcher, *Hamatopus ostralegus*; not uncommon on the western coast of Cornwall and at Scilly.

Common Heron, *Ardea cinerea*; generally distributed in suitable localities, especially in creeks and estuaries. There is a Heronry on the Lamorran river, near Truro; another near Fowey.

Purple Heron, *A. purpurea*; two adult examples in perfect plumage obtained in the county within the last few years.

Squacco Heron, *A. comata*; occasional visitant in the spring months.

Little Bittern, *A. minuta*; very rare: a specimen was lately obtained from St. Hilary and Scilly.

Common Bittern, *Botaurus stellaris*; not uncommon at uncertain periods.

Night Heron, *Nycticorax Europæus*; occasionally met with and specimens obtained from East and West Cornwall.

White Stork, *Ciconia alba*, Cornish; very rare: only one recorded instance, and that at the Land's-end, in May, 1848.

Black Stork, *C. nigra*; very rare: a specimen killed either on the Tamar or Lynher, in 1831.

White Spoonbill, *Platalea leucorodia*; occasionally, and especially of late years, observed in various parts of the county, and at Scilly.

Glossy Ibis, *Ibis falcinellus*. On September 19th, 1854, the glossy ibis was shot at Tresco, Scilly.

Common Curlew, *Numenius arquata*; common on the sea-coast, and in harbours, creeks, and estuaries.

Wimbrel, or May Bird, *N. phaeopus*; observed in the latter part of April and again in the autumn, in going to and returning

Wood Sandpiper, *T. glareola*; not uncommon in the autumn, and sometimes in the spring months.

Common Sandpiper, *T. hypoleucos*; summer visitant.

Greenshank, *T. glottis*; not uncommonly met with in the same localities as the redshank. This bird shews the connecting link between the sandpiper and the godwits, in the form of the beak, which turns a little upwards.

Avocet, *Recurvirostra avocetta*; very rare as a Cornish bird: one obtained from the Land's-end, apparently a bird of the year, in September, 1847.

Black-tailed Godwit, *Limosa melanura*; occasional visitant.

Bar-tailed Godwit, *L. rufa*; generally to be met with in the autumnal months on flat sands and estuaries. In summer the breast of this species is bright bay, in winter white; the breast of the bird of the year, until the next summer, buff.

Ruff, *Machetes pugnax*; occasionally met with in the autumnal months only in the marshes in the Land's-end district.

Woodcock, *Scolopax rusticola*; winter visitor: universally distributed.

Great Snipe, *S. major*; very rare generally in the western counties.

Common Snipe, *S. gallinago*; universally distributed in suitable localities: a brown variety, with the dorsal stripes narrower, occasionally met with.

Jack Snipe, *S. Gallinula*; as universally distributed as the last-named species.

Sabine's Snipe, *S. Sabini*. This variety of the common snipe, as it is supposed to be by some, and doubted by others, was killed near Carnanton, in the neighbourhood of St. Columb, in January, 1862; also at Madron recently.

Brown Snipe, *Macrorhampus griseus*; very rare as a British bird, five or six examples only having occurred: one reputed to have been killed in Devon. Very common on the shores of America. The first and only example of this rare species in Cornwall (a bird of the year) occurred at Scilly, on the 3rd of October, 1857.

Curlew Tringa, *Tringa subarquata*; common in the autumnal months along our flat beaches.

Knot, *T. canutus*; a few observed on most of our flat beaches in the autumnal and spring seasons: in summer plumage the breast is bright red, in winter, white.

Buff-breasted Tringa, *T. rufescens*; very rare—two examples only recorded of its capture in Cornwall, one between Penzance and Marazion; the other on high ground near Chûn Castle, Morvah.

Little Stint Tringa, *T. minuta*; occasionally seen, and specimens obtained from salt marshes near the sea.

Temminck's Stint Tringa, *T. Temminckii*; found occasionally in the same localities as the last-named species, but not so frequently.

American Stint, *T. pusilla*. An example killed in Marazion marsh, October 10th, 1854.—This is the first recorded British specimen, killed by Mr. W. H. Vingoe.

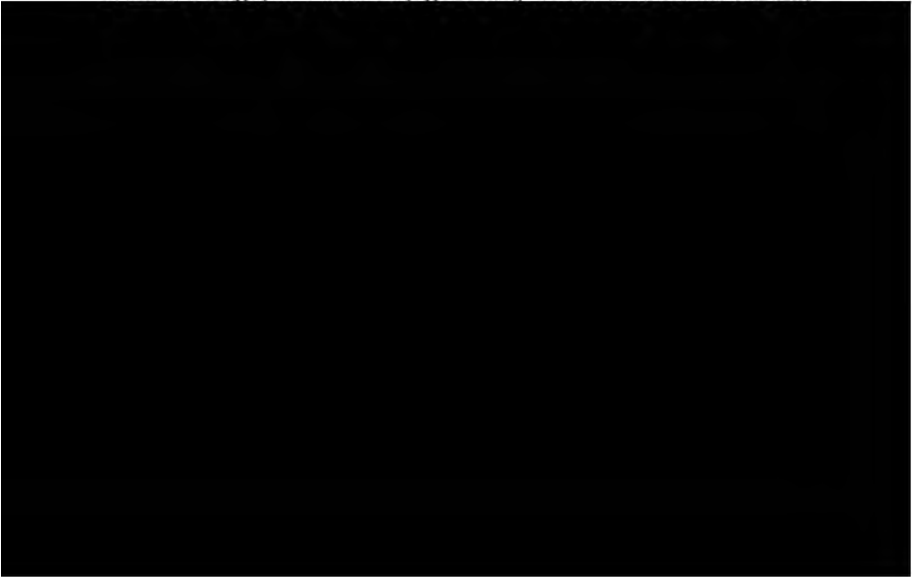
Schinz's Tringa, *T. Schinzii*; two specimens killed on Hayle estuary, in Oct., 1846.

Pectoral Tringa, *T. pectoralis*. I quote the words of Mr. Yarrell in reference to the capture of this interesting species in Cornwall:—

"D. W. Mitchell, Esq., of Penzance, sent me in June, 1840, a coloured drawing of the natural size, and a fully detailed description with measurements, of a sandpiper, shot by himself on the 27th of the previous month, while the bird was resting on some sea-weed within a few yards of the water on the rocky shore of Annet, one of the uninhabited islands of Scilly.—On the following day another example was seen, but became so wild after an unsuccessful shot that it took off to another island and escaped altogether.—The close accordance of the specimen obtained with the description of *Tringa pectoralis* in summer plumage in the 4th part of M. Temminck's *Manual*, led Mr. Mitchell to a true conclusion as to the species and its novelty and interest in this country."

Several obtained since from Scilly.

Dunlin Tringa, *T. variabilis*; generally distributed on all our flat



Baillon's Crake, *Crex Baillonii*; a rare British species: one specimen obtained from the basin of Penzance pier, another from Zennor, and a third from Marazion marsh in 1877.

Moor-hen, *Gallinula chloropus*. The remarks on the water-rail apply to this species.

Water Rail, *Rallus aquaticus*; generally met with in suitable localities.

Common Coot, *Fulica atra*; common in marsh pools, &c.

Grey Phalarope, *Phalaropus lobatus*; occasional visitant, and often in large numbers, in the autumnal and winter months, but at uncertain intervals.

Red-necked Phalarope, *Lobipes hypoboreus*; occasional visitant, found inland near fresh water.

#### NATATOIRES.—(SWIMMERS.)

Grey Lag Goose, *Anser ferus*. A specimen was shot in Marazion marsh in the early part of March, 1862.

Bean Goose, *A. segetum*; this is our common wild goose.

White-fronted Wild Goose, *A. albifrons*; not unfrequently obtained at the Land's-end in the winter months.

Bernicle Goose, *A. bernicla*; occasionally obtained from the Land's End-marshes.

Brent Goose, *A. brenta*; occasional visitant, and in considerable flocks in hard winters.

Spur-winged Goose, *A. gambensis*; the only recorded British specimen was killed near St. Germans, in June, 1821, and, in a mutilated state, was given by Mr. Henry Mewburn of that place.

Hooper, or Wild Swan, *Cygnus ferus*; the hooper is generally observed in the western counties after a long continuance of hard frost.

Bewick's Swan, *C. Bewickii*. This species was so long confounded with the former, as a small variety, that I have ventured to record it as Cornish.

Mute Swan, *C. olor*; only known as domesticated.

Common Shieldrake, *T. vulpanser*; not uncommon in severe winters.

Shoveller, *Spathulea clypeata*; not uncommon in severe winters.

Wild Duck, *Anas boschas*; universally distributed.



Gadwall, *Cauliodus strepera*; rare: one specimen, and the only one recorded from this neighbourhood.

Pintail Duck, *Querquedula acuta*; common in the Land's-end district in severe weather.

Garganey, *Q. circa*; a spring visitor in Cornwall: a few summers since several were obtained in the neighbourhood of Penzance in very beautiful plumage.

Teal, *Q. crecca*; the most regular of our duck visitors every winter, appearing sometimes early in the autumn.


Wigeon, *Mareca Penelope*; a regular visitor to the Land's-end district.

Eider Duck, *Somateria mollissima*; one specimen killed on the river Looe: rarely seen in southern latitudes.

Velvet Scoter, *Oidemia fusca*; sometimes seen in Mount's-bay, and one shot at Penzance quay.

Common Scoter, *O. Nigra*; rare: occasionally seen in Mount's-bay and captured. All the scoters are oceanic in their habits, and are more frequently seen at sea than inland.

Surf Scoter, *O. perspicillata*; a rare bird in England, and only occasionally seen in the north of Scotland. A specimen of this duck in adult plumage was picked up in a dying state on the beach at St. Mary's, Scilly, on the 22nd September; the autumnal moult was completed and the plumage yet black,—the white on the top and back of the head, pure white,—the colour of the anterior portion of the bill, Seville-orange yellow—nail, grayish-yellow



Smew, *Mergus albellus*; rare: a few instances of its occurrence on record.

Red-breasted Merganser, *M. serrator*; generally a winter visitor.

Goosander, *M. merganser*; sometimes observed in Mount's-bay, but only in winter plumage: the adult male has the breast of a beautiful glowing maroon buff colour.

Great Crested Grebe, *Podiceps cristatus*; not uncommon in winter on marshes.

Red-necked Grebe, *P. rubricollis*; quite as often occurring as the last-named species,—frequenting the same localities.

Horned Grebe, *P. cornutus*; specimens not in adult pluma occasionally obtained from the Land's-end district.

Eared Grebe, *P. auritus*; specimens not unfrequently obtained, but generally in immature plumage: a specimen in adult summer plumage obtained some years since from St. Just pool, Falmouth harbour, and now in the Truro museum.

Little Grebe, *P. minor*; the most commonly distributed of all the grebes in the Land's-end district. In summer plumage the neck is dark-red with the chin black.

Great Northern Diver, *Colymbus glacialis*; found in more or less numbers every year, generally in immature plumage, and in the autumnal months; though of late years some specimens in the adult state have been killed.

Black-throated Diver, *C. arcticus*; more rare than the former species, sometimes seen in Mount's-bay.

Red-throated Diver, *C. septentrionalis*; common in the autumnal and winter months in Mount's Bay, and at this season invariably found without the red throat, and in the plumage represented by Bewick as the "speckled diver."

Common Guillemot, *Uria troile*; frequently seen singly, and in small parties, in Mount's-bay, and around our coast.

Ringed Guillemot, *U. lacrymans*; the specific distinction of this bird from the common guillemot is doubted.

Black Guillemot, *U. grylle*; rare on the western coasts of Cornwall: one example, in intermediate plumage, taken some years since in Mount's-bay.

Little Auk, *Mergulus melanoleucos*; not frequently met with on our coasts,

Puffin, *Alca fratercula*; occasionally observed on the Land's-end cliffs, but the precipitous rocks on some of the islands at Scilly appear to be its favourite haunts.

Razor Bill, *A. torda*; a common species.

Common Cormorant, *Phalacrocorax carbo*; generally distributed throughout the western coast of Cornwall.

Common Shag, *P. cristatus*; more numerous as a species than the last-named, and more frequently observed in creeks and arms of the sea.

Gannet, *Sula bassana*; not unfrequently observed, and sometimes in small companies, in Mount's-bay and on the north coast.

Sandwich Tern, *S. cantiaea*; a few pairs observed in the summer months on some of the islands at Scilly.

Roseate Tern, *S. Dougalli*; formerly abundant in summer at Scilly: breeds on Annet, a Scilly rock, and some other localities near.

Common Tern, *S. hirundo*; more or less common in the summer in Mount's-bay, approaching nearer the shore in windy weather: less abundant at Scilly than the roseate or arctic terns.

Arctic Tern, *S. Arctica*; a common species in summer both on our coast and at Scilly, at which latter locality its eggs may be obtained every year.

Whiskered Tern, *S. leucopareia*; an immature specimen obtained in the month of September, 1851, at Scilly.

Gull-billed Tern, *S. Anglica*; a few examples only have been

- Little Gull, *L. minutus*; rarely met with, but specimens in adult and immature plumage have been obtained at Penzance and the Land's-end,—the latter in the month of December, 1844.
- Black-headed Gull, *L. ridibundus*; not uncommon on the sands at Hayle and elsewhere, in winter.
- Kittiwake Gull, *L. tridactylus*; common on our coasts generally.
- Ivory Gull, *L. eburneus*; very rare: the only recorded example of this bird in Cornwall was captured off the pier at Penzance, in the month of February, 1847.
- Common Gull, *L. canus*; generally distributed in more or less numbers along our coasts.
- Bonapartian Gull, *L. Bon* (See Yarrell's 2nd "Supplement," p. 55); an immature specimen killed in Falmouth harbour, in June, 1865.
- Lesser Black-backed Gull, *L. fuscus*; generally distributed, with the herring gulls, in large numbers on our flat sands and open estuaries.
- Herring Gull, *L. argentatus*; the most common gull on our coast, and generally distributed in estuaries, creeks, open sands, and precipitous cliffs.
- Great Black-backed Gull, *L. marinus*; one or two may be seen, at all times and seasons, in different localities along our coast.
- Glaucus Gull, *L. glaucus*; occasionally observed, but by no means regularly or frequently.
- Iceland Gull, *L. islandicus*; rare. A specimen of the Iceland gull in the state of plumage almost amounting to pure-white, obtained from Scilly.
- Common Skua, *Lestris catarractes*; rarely met with in the western counties: observed at the Wolf rock in considerable numbers in 1863.
- Pomerine Skua, *S. pomarinus*; occasionally, and at uncertain intervals, occurring on our coast, and in every instance in immature plumage.
- Richardson's Skua, *L. Richardsonii*; rarely observed on our coast, and more rarely in adult plumage.
- Buffon's Skua, *L. parasiticus*; very rare: a specimen found inland in the parish of St. Buryan, in adult plumage.

Greater Shearwater, *Puffinus major*; occasionally seen, and specimens obtained from Mount's-bay.

Manx Shearwater, *P. anglorum*; common at Scilly, where it annually breeds in rabbit-holes.

Fulmar Petrel, *Procellaria glacialis*; very rarely observed in the south of England: one specimen taken alive at the Land's-end.

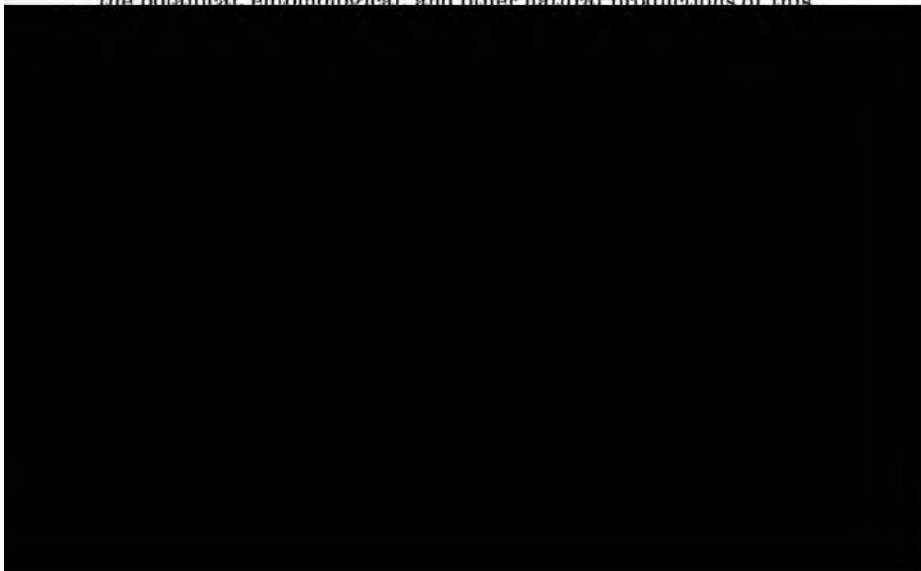
Wilson's Petrel, *P. Wilsonii*; one specimen only obtained from Cornwall, and this was found dead in a field near Polperro; it passed into the hands of Mr. Couch, who forwarded it to Mr. Yarrell, whose figure of this bird was taken from the Cornish specimen.

Fork-tailed Petrel, *P. Leachii*; several specimens of this small petrel have from time to time been obtained on our coasts.

Storm Petrel, *P. pelagica*; of frequent occurrence in the summer months, and observed at a distance of five or six miles at sea. Abundant at Scilly, where they breed. Egg white, with a rufous zone at the larger end.

#### APPENDIX.

From the year 1843 to the present time much attention has been given to the Natural History of the Isles of Scilly: valuable contributions have been given in our Geological and Natural History Reports on the geology of the islands, and on the botanical, entomological, and other natural productions of this



The following is a list of some of the rarer and more interesting species of British birds observed and captured at Scilly.

Pectoral Sandpiper, *Tringa pectoralis*.—Isle of Annet, Scilly ..... May 29th, 1840.

Ring Dottrel, *Charadrius hiaticula*.—Breeds. .. April 25th, 1843.

Hoopoe, *Upupa epops*.—At different times since 1843, to present time.

Scops Owl, *Strix Aldrovandi*.—The grey figure of this owl in Gould's "Birds of Great Britain" is a male bird, and drawn from this specimen. .... April, 1847.

Night Heron, *Ardea nycticorax* ..... May, 1849.

Osprey, *Pandion halietus* ..... May, 1849.

|  |  |
|--|--|
| Pied Flycatcher, <i>Muscicapa luctuosa</i> . | } September, 1849, during autumnal migration,— apparently in transitu only, as they are not found in Cornwall in the spring. |
| Reed Wren, <i>Salicaria arundinacea</i> .    |  |
| Woodchat Shrike, <i>Lanius rufus</i> ..      |  |
| Garden Warble, <i>Curruca hortensis</i> .    |  |
| Wryneck, <i>Yunx torquilla</i> .....         |  |

Spoonbill, *Platalea leucorodia*..... June, 1850.

Ortolan Bunting, *Emberiza hortulana* ..... October, 1851.

|   |                    |
|---|--------------------|
| Little Stint, <i>Tringa minuta</i> .....        | } September, 1851. |
| Whiskered Tern, <i>Sterna leucoporeia</i> ..... |                    |

Lesser Grey or Rose-breasted Shrike, *Lanius minor* (the first British specimen) ..... November, 1871.  
(See Gould's "Birds of Great Britain.")

|   |                  |
|---|------------------|
| Fire-crested Wren, <i>Regulus ignicapillus</i> .... | } October, 1851. |
| Richard's Pipit, <i>Anthus Richardi</i> .....       |                  |

Montague's Harrier, *Circus cineraceus*.—Three specimens; one with a thrush's egg in its mouth ..... April, 1852.

|   |              |
|---|--------------|
| Gull-billed Tern, <i>Sterna Anglica</i> ..... | } May, 1852. |
| Iceland Gull, <i>Larus islandicus</i> .....   |              |

Goosander, *Mergus serrator* ..... December, 1853.

|  |   |                  |
|--|---|------------------|
| Short-toed Lark, <i>Alauda brachydactyla</i> . . . .       | } | September, 1854. |
| Glossy Ibis, <i>Ibis falcinellus</i> . . . . .             |   |                  |
| Schinz's Sandpiper, <i>Tringa Schinzii</i> . . . . .       | } | October, 1854.   |
| Hawfinch, <i>Loxia coccythraustes</i> . . . . .            |   |                  |
| White-fronted Goose, <i>Anser albifrons</i> . . . .        |   |                  |
| Pied Flycatcher, (young), see <i>ante</i> . . . .          |   | September, 1857. |
| Lesser Whitethroat, <i>Curruca garrula</i> . . . . .       | } | October, 1857.   |
| Landrail, <i>Gallinula crex</i> . . . . .                  |   |                  |
| Brownsnipe, <i>Macroramphus griseus</i> . . . . .          |   |                  |
| Temminck's Stint, <i>Tringa Temminckii</i> . . . .         |   |                  |
| Long-eared Owl, <i>Otus vulgaris</i> . .                   | } | Every year.      |
| Short-eared Owl, <i>O. brachyotus</i> . .                  |   |                  |
| Merlin, <i>Falco Esalon</i> . . . . .                      | } | December, 1859.  |
| Purple Sandpiper, <i>Tringa maritima</i> . . . . .         |   |                  |
| Cirl Bunting, <i>Emberiza cirrus</i> . . . . .             |   |                  |
| Bramble Finch, <i>Fringilla montifringilla</i> . . . .     |   |                  |
| Red Phalarope, <i>Phalaropus hyperbora</i> . . . .         | } | October, 1860.   |
| Brent Goose, <i>Anas Brenta</i> . . . . .                  |   |                  |
| Golden Oriole, <i>Oriolus galbula</i> (first recorded) . . |   | June, 1861.      |
| Pallas's Sand Grouse, <i>Syrrhaptes paradoxus</i> . . . .  |   | June, 1863.      |

|               |      |  |
|---------------|------|--|
| Grey Plover   | ..   | } Periodical migrants, varying, according to<br>circumstances, in numbers and time of<br>appearance. |
| Little Grebe  | .... |  |
| Chaffinch     | ..   |  |
| Linnet        | .... |  |
| Green Linnet  | ..   |  |
| Blackbird     | .... |  |
| Thrush        | ..   |  |
| Fieldfare     | .... |  |
| Redwing       | ..   |  |
| Starling      | .... |  |
| Peewit        | ..   |  |
| Golden Plover | ..   |  |
| Larks         | .... |  |
| Missel Thrush | ..   |  |
| Goldfinch     | .... |  |



# VERTEBRATA—REPTILIA & AMPHIBIA.

*Revised by Thos. Cornish.*

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I HAVE revised Mr. Couch's list of Cornish reptiles after having revised his list of Cornish fishes, and therefore I must beg leave to refer to the remarks with which I preface that list for an explanation of my process now.

## REPTILIA—(REPTILES).

“Luth” or “Leathery Turtle” (*Sphargis Coriacea*). Borlase records the occurrence of this turtle in Cornish seas, and there is no reason to doubt the correctness of his observation. Certainly several have been taken on the coast of France, and some on the coast of England. It is a powerful swimmer.\*

“Green Turtle” (*Chelonia viridis*.) The turtle which yields the green fat of turtle soup, A specimen, covered with barnacles and sea weed, was taken alive and in vigorous condition, in a drift net about two miles south of Mousehole Island, in Mount's Bay, on 5th October, 1874. This turtle sometimes appears in English waters, washed overboard from ships or out of a wreck, but it is probable that

are probably correct, but I myself have never seen it west of Dartmoor.

The Viviparous or Scaly Lizard (*Zootoca vivipara*) is not uncommon. These are the only two lizards known to be natives of England.

The Slow-worm (*Anguis fragilis*). The Blind Worm. Very common.

The Snake (*Tropidonotus natrix*.) The common snake. By no means uncommon, but local in its habitat. Couch says of it that "it has been found six feet in length," but this must be a mistake. There is no record of the occurrence of an English snake of more than four feet in length, and a specimen which exceeds three feet is unusual. This snake takes readily to water, in which it swims partly submerged with its head erect.

Viper (*Pelias Berus*) adder, long-cripple. The only British reptile capable of causing a poisoned wound; common in some localities. Never attains the size of the common snake at its largest. Can swim as the snake does, but does not take to water voluntarily. "Red Viper" may be considered abandoned as a distinct species. The story that the viper swallows its young to protect them from danger may be regarded as mythical.

Newt. Two species only are admitted as English by the authorities of the British museum. The crested newt (*Triton vulgaris*), and the smooth newt (*Lophinus vulgaris*.) The other dissimilar newts are treated as mere accidental varieties. The crested newt and its consort are entirely aquatic. The smooth newt is in my experience more often found on land than in water. Both species occur in Cornwall and correspond, the "triton palustris" of Couch to the "triton vulgaris" and the "Triton punctatus" of Couch to the "lophinus vulgaris." These little lizards are called by very many names "asker," "evat," "eft," and even "salamander" can be heard of them in Cornwall. The newts are easily tamed and very playful. The "crested newt" derives its name from the fact that the male developes in the breeding season a membraneous crest, which it is without during the rest of the year.

Frog (*Rana temporaria*). The common frog. In its young form after leaving its tadpole stage, it is known as "Quilkin."

Toad (*Bufo vulgaris*.) Common and perfectly harmless. Can make itself stink disagreeably, but that is all.

I do not think that the edible frog (mentioned by Mr. Couch in the "Fauna") can be maintained as belonging to Cornwall.

But I consider that the common land tortoise (*Testudo græca*), having bred in Cornwall, is as much entitled to admission into the Fauna of Cornwall as any other import which has proved permanent (say for instance, perch, carp, gold fish, or even horses, or canaries).

## VERTEBRATA.—PISCES.

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*Corrected and Revised by Thomas Cornish*

SINCE the late Mr. Jonathan Couch wrote on the fishes of Cornwall in his "Cornish Fauna," thirty nine years have elapsed. Within that period Yarrell has published an Appendix to each of his two volumes; Couch himself has published his "British Fishes;" "The Zoologist" has been an open record of all the new observations on British Fishes, and last (and least) I have had myself the pleasure of maintaining a constant correspondence on Ichthyology with Mr. Couch during the last twelve years of his life, and whilst I was yet in leading strings as a naturalist I enjoyed the great advantage of a close personal friendship with the well-skilled son of a well-skilled father, the late Mr. R. Q. Couch, of Penzance. Of course in the lapse of so many years many new fishes have been observed in our Cornish seas, and many observations on old ones have been corrected, and therefore with the advantages of which I boast I approach the revision of Mr. Couch's list of fishes with less diffidence than I should otherwise have felt.

His work must stand. It is a perfectly accurate record of the state of ichthyological knowledge in 1838, and in revising it I propose to leave out a good deal of information which was very interesting then but has been since superseded; and I hope to add some details of more active interest at the present time.

For the sake of preserving as much similarity in the two lists as is possible I propose to follow the classification adopted by Mr. Couch, but as he is now himself a greater authority than the author (Jenyns) whom he most frequently quotes, and whose work is now but rarely to be met with, I shall substitute his own work ("Couch's British Fishes," 1st ed., 1862-1865) for that of the older writer. This course will be attended by the further advantage that in making Couch's British Fishes the book on which I work I can shorten my list by the omission of all reference to it. Whoever wishes to learn the full history of any fish


named has but to refer to the index in the fourth volume of the book, and he will there find out where to read of it.

There is one difficulty connected with the detailing of a list of British fishes observed in Cornwall to which I must call attention. Of course we score everything as of Cornwall which we actually catch on the Cornish coast, and if a specimen occurs in Plymouth harbour (as of the hippocampus) we may fairly claim it as occurring in the Cornish seas, but we frequently obtain rare specimens from the stomach of a cod (which fish some one has wittily termed the "naturalists' purveyor,") or rare fish are taken in the Bristol channel (surely a Cornish sea), off the Welsh coast, or are landed by some captain of a ship who has procured them on his voyage home (as for instance, "Remora" from the Bay of Biscay), or they are taken by our driving boats many leagues south and west of the Scilly islands. Are these specimens Cornish fish? They present themselves in our museums, and on the whole I am inclined to give them rank as Cornish fishes. We are, I think, entitled from our promontorial position to regard as our own all fish which come within the sweep of our fishermen, or of vessels landing them in fresh condition on our shores.

*PERCIDÆ*.—(THE PERCH KIND).

Perch. (*Perca Fluviatilis*). A freshwater fish; not an aborigine of Cornwall, but naturalised in many ponds.

Basse. (*Labrax Lupus*). Common in harbours, in sandy bays, and on a lee shore in rough weather. Weighs on an average 8 lbs.



been taken at Looe," but he does not record it in his "British Fishes," nor does Yarrell mention it. It is probable therefore that Mr. Couch concluded his record of it was doubtful.

Dentex. (*Dentex vulgaris*). Four-toothed sparus. Has been observed twice off Falmouth.

Mendole. (*Sparus mæna*). The Cackarel. A Mediterranean fish recorded as having once occurred at Falmouth.

The Red Mullet. (*Mullus Surmuletus*). The striped red mullet, "The woodcock of the sea." Very common. Has been taken in Mount's Bay of the weight of 39½ oz.

Plain Red Mullet. (*Mullus Barbatulus*). Mr. Couch mentions this fish as Cornish, but I believe when he wrote there was a confusion between plain red mullet and one of the gurnards (*Mullus Imberbis*). I do not think that the occurrence of Mullus Barbatulus in Cornwall is anywhere recorded.

The Weever. (*Trachinus Draco*). The Sting Bull. The Poison fish. The Canker. Very good eating, but its first dorsal contains a poison bag at the base of the rays, which had better be cut out before the fish is cooked. The fish is able by means of these dorsal rays to inflict a poisoned wound, which causes swelling and much pain as far as the elbow joint. It is common in some sands, but is never found in rocky grounds.

Lesser Weever. (*Trachinus Viperæ*). Shorter and deeper than the last-named, much more rare. Found occasionally at Hayle and at Pra Sands in Breage.

#### TRIGLIDÆ.—(GURNARDS).

Elleck. (*Trigla Cuculus*). . Red Gurnard. Red fish. Soldier Halleck. Common off every coast.

Tub. (*T. Hirundo*). Sapphirine Gurnard. Common.

Piper. (*T. Lyra*). Stated by Mr. Couch in the Fauna to be common, but it certainly is not so in West Cornwall.

Streaked Gurnard. (*Mullus imberbis*). The Rock Gurnard. The French Gurnard. The Parson. Formerly confounded with plain red mullet (which see). Not uncommon on shoal rocky ground.

Grey Gurnard. (*T. Gurnardus*). The Gurnard. Very common.

- Bloch's Gurnard. (*T. Blochii*). Distinguished from Elleck by its blunt profile and dark colour. By no means uncommon.
- Lanthorn Gurnard. (*T. Lucerna*). The Long-finned Captain. Recorded as having occurred once at Plymouth. Very rare.
- Little Gurnard. (*T. Pæciloptera*). A very small fish. Very rare. Has been taken at Falmouth and in the Bristol Channel.
- Armed Gurnard. (*Peristedron malarum*). Mailed Gurnard. Very rare.
- Pogge. (*Aspidophorus cataphractus*). Armed Bullhead. Sea Poacher. Black sting fish. Mentioned by Couch as not uncommon. I have never seen a specimen.
- Miller's Thumb. (*Cottus Gobio*). River Bullhead. A fresh-water fish. Common.
- Fatherlasher. (*Cottus Scorpius*). Sea Scorpion. Sting fish (but it does not sting. It is so called from the complete spine armament of its head.) Found inshore. Common.
- Lucky Proach. (*Cottus Bubalis*). Also called Fatherlasher. Common in deep water with rocky bottom.
- Three-spined Stickleback. (*Gasterosteus Spinulosus*). Banstickle. Pricklefish. Mr. Couch says of it "It is not uncommon, though not in abundance. It ascends our rivers in May." My experience of it is that it is a very common fish, and a permanent resident in our small brooks, where it is frequently mistaken for (and called) the minnow.

Fifteen-spined Stickleback. (*C. Spinosus*). Sea Adder. Often



*SPARIDÆ*.—(SEA BREAMS).

Black Bream. (*Cantharus Griseus*). Old wife. Stone basse.

Common in some localities (off Rinsey and Trewavas Heads in Mount's Bay for instance), but usually rare. An excellent fish for the table.

Bogue. (*Boops vulgaris*). Box. Ox-eye. Rare.

Becker. (*Pagrus vulgaris*). Braise. Not common, and when occurring frequently confounded with common bream. An excellent table fish.

Couch's Sea Bream. (*Pagellus Rondeletii*). Only a single specimen is recorded.

Spanish Bream. (*P. Erythrinus*). Couch in "British Fishes," distinguishes this from *Erythrinus* (so called by him as its English name), but I am confident that the differences between the two fish are only those caused by size and accidental circumstances.

Bream. (*P. centrodonatus*). When half-grown, "Ploser." When young, "Chad." Common everywhere.

Short Sea-Bream. (*P. Curtus*). Distinguished by Couch in his British Fishes but only one specimen is recorded.

Gilthead. (*Chrysophrys Aurata*). Rare. Last recorded occurrence off Land's End, 1st March, 1870.

Couch here follows with :—

Rays Bream (*Brama Raiti*), which is not a Bream at all, but one of the scalerayed (*squammpennes*) family. Natives usually of the tropics. This fish has occurred several times, but always, thus far, in an exhausted state, wave-beaten on a beach.

On 9th October, 1874, a specimen of another scalerayed fish occurred alive in Mount's Bay. It was identified as one of the Family Pimelepterus (Cuvier), and named *P. Cornubiensis*. It also is tropical, and has no English name. It is described in Zoologist, 2nd series, No. 111, p. 4255, December, 1874.

*SCOMBERIDÆ*.—(THE MACKAREL TRIBE).

Mackarel. (*Scomber scombrus*). Common. Having taken the opportunity of a voyage from the Scilly Islands in the busy part of the mackarel season of 1874, to inspect over 15000,

\* There were over 60,000 mackerel on board, but 45,000 were packed in "pads" before we started.



mackarel, I can say with confidence that the fish described in British Fishes as "dotted" and "scribbled" mackarel are accidental varieties.\*

Spanish Mackarel. (*Scomber maculatus*). I am very doubtful also whether this is a distinct species. Its variation from the typical fish does not appear to me to be sufficient to distinguish it.

Tunny. (*Thynnus vulgaris*). Not uncommon as a spring and summer visitor, but not often taken.

Bonito. (*Scomber pelamis*). Same.

Germon. (*Orcynus alalonga*). Longfinned Tunny. Very rare.

Pelamid. (*Pelamis sarda*). Belted Bonito. I take this to be a fish known to mackarel fishermen as the albacore, and if so it is common in spring and summer.

Plain Bonito. (*Auxis vulgaris*). Rare. A specimen has been recently (1877) taken in Mount's Bay.

Shortfinned Tunny. (*Thynnus brachypterus*). Very rare.

Pilot Fish. (*Naucrates ductor*). Not an uncommon visitor. Frequently follows vessels into our harbours.

John Dorée. (*Zeus faber*). Common.

Blackfish. (*Centrolophus pompilus*; *Coryphæna pompilus*). Rare.

Has been usually taken in company with a shark or some other large fish.

Cornish Centropholus. (*C. Britannicus*). A specimen was thrown on shore near Looe in February, 1859.

Ausonia Cuvieri. A single specimen was taken at Falmouth in 1866. It is supposed to have occurred twice only in British

*TÆNLÆDÆ*.—(SCABBARD FISHES).

The Scabbard fish. (*Lepidopus Argyreus*). Rare.

Silvery Hairtail. (*Trichiurus lepturus*). Not uncommon of late years. Remarkable for its barbed teeth and enormous gape. Couch (see British Fishes, vol. II, p. 63) was apparently misled as to this latter fact by having seen only specimens which had been dead for some time, and which were consequently stiff.

Banks Oarfish. (*Regalecus Banksii*). Hawkins' Gymnetrus. Occurred at Newlyn in Mount's Bay once, at some date between 23 February, 1788 and 1796. The confusion has arisen from the existence of several copies of a sketch of it, bearing different dates, but which are evidently copies of one original. There is a trace, but not a record, of its occurrence once subsequently at Marazion. This is the "Ceil Conin," and the "King of the Herrings."

Red Bandfish. (*Cepola rubescens*). Red Snakefish. Couch (Fauna) speaks of it as "not uncommon." I have heard of its capture, on competent authority, off the coast of Cornwall, but I have never seen a specimen, and curiously enough Couch, though (British Fishes) he speaks of it as common in the south and west of England, does not record a capture of it in Cornish waters.

*MUGILIDÆ*.—(THE MULLET).

Grey Mullet. (*Mugil capito*). Common. The object of large fisheries in many parts of Cornwall.

Lesser Grey Mullet. (*Mugil chelo*). Thicklipped grey mullet. Rare.

Atherine. (*Atherina presbyter*). Sand Smelt. A frequent visitor in autumn in large shoals. It takes a bait readily and is excellent eating. It is said never to frequent waters in which the smelt (*Osmerus eperlanus*) is to be found.

Boiers' Atherine. (*Atherina Boieri*). Large shoals of this rare fish occurred at Polperro in 1846.

Longfinned grey mullet. (*Mugil Auratus*). Golden mullet. A specimen was captured in Mount's Bay about 1865.

Trumpet fish. (*Centriscus scolopax*). Bellows fish. Has been recorded as having occurred three times in Cornwall.

*Gobioidæ*.—(THE BLENNIES).

The Gattorugine. (*Blennius Gattorugine*). The Tompot. Common.

The Butterfly Blenny. (*Blennius ocellaris*). Not uncommon near Falmouth, but elsewhere it is rare.

The Shanny. (*B. pholis*). The Bully or Bulcod, dear to the youth of our sea-coasts. The smooth Blenny. Common everywhere. Voluntarily spends a large portion of its time out of water in the crevices of the rocks, and can, by the aid of two false pectorals and its tail direct its motions when on shore.

Montague's Blenny. (*B. Montagu*). Not uncommon.

Yarrell's Blenny. (*Blenniops Ascarii*). Not uncommon in Cornwall, but rare in West Cornwall.

Butterfish. (*Gunnellus vulgaris*). Nine eyes. Spotted gunnel. Common. Traditionally said to have derived its name of Gunnel from the ignorance in common of the naturalist who first observed it, and of a fisherman to whom he showed it. The fisherman said "it looked very much like a gunnel" (meaning the gunwale of a small boat), and the naturalist assumed that the fisherman knew the fish, and had called it by its proper name. Couch (see "Fauna") alludes to this.

The Wolf-fish. (*Anarchichas lupus*). The Catfish. Very rare.

The Rock Goby. (*Gobius niger*). The black goby, also called Miller's thumb. Common.

The Paganellus. (*G. Paganellus*). A Mediterranean species.



as the "young of some better known species." Nothing but aquariums can settle these questions for us.

The Yellow Skulpin. (*Callionymus lyra*). The Gemmeous dragonet. This very handsome fish is now recognised as the adult male, whilst the dusky skulpin or sordid dragonet (*C. dracunculus*) is the adult female or immature young of the same fish. It is heavily armed with a jagged spine at the lower back angle of the operculum. Though small, its flesh is excellent. Not uncommon.

The Angler. (*Lophius piscatorius*). The fishing frog. The Devil fish. Common.

Couch abandons the small winged angler and the long angler.

#### LABRIDÆ.—(THE WRASSES).

(Pronounced, in the singular, Ráa). I follow Mr. Couch (see "Fauna") in giving the Wrasses with great reservation. He speaks of the confusion from which they were only "emerging" when he wrote in 1838, but I, having had unusual opportunities of examining the family, (having, for several years for a holiday month outright, caught never less than a dozen a day, of all sorts of wrasse) am at present inclined to a belief that the Labridæ are not of so many species as the books say, and that the confusion which Mr. Couch noticed in 1838 is by no means at an end.

Ballan Wrasse. (*Labrus maculatus*). The "Johnráa" of the country people. Very common. With this one, must go, in my opinion, the greenstreaked wrasse (*L. lineatus*) as its female or immature young. Couch (Fauna) apparently at one time favoured this view, although he retains the green wrasse in his larger work.

The Comber. (*L. Comber*). This wrasse is rare if it is a distinct species, but I incline to think it an accidental variation of the young Ballan wrasse.

The Blue striped wrasse. (*L. coquus*). Male; takes with it as its female the three-spotted wrasse (*L. trimaculatus*), and together are a beautiful pair of fish, and not at all uncommon.

The Scalerayed Wrasse (*Acantholabrus Couchii*) is admitted by Yarrell and by Couch, but is so rare, and its peculiarity of being scale-rayed is so un-English, that I am unwilling to rank it as a Cornish wrasse, although it may well be a scale-

rayed visitor from the tropics of some other species, just as were Ray's bream and *Pimelepterus Cornubiensis*.

Rock cook. (*Acantholabrus exoletus*). Small mouthed wrasse.

Common and well defined, but I am by no means certain that it is not *L. maculatus* or *L. coquus* in its young form.

Corkwing. (*Crenilabrus Cornubicus*). Gold finny. Very common, but as Couch says, "the Corkwing like others of its family varies in its colours.

Jago's Goldsinny. (*Crenilabrus rupestris*), Cuvier). Common, but it is frequently a matter of great difficulty to say when a specimen is corkwing and when goldsinny.

Rainbow Wrasse (*Julis vulgaris*) has occurred once only. In Mount's Bay.

Two-spotted Wrasse (see "Fauna") is probably another name for the three-spotted wrasse. See Yarrell, Vol. I, p. 286, ed. 1836, where he gives the synonym of "Doubly-spotted wrasse" to *L. trimaculatus*. Hog wrasse is abandoned by Couch in British Fishes.

I think I have said enough to show that the classification of the Labridæ is in a most unsatisfactory condition, and requires the close attention of ichthyologists.

#### CYPRINIDÆ.—(THE CARPS).

The Carp. (*Cyprinus carpio*). A pond fish throughout Cornwall.

The Gudgeon (*Gobio fluviatilis*) said by Couch (British Fishes) to have been introduced of late into Cornwall, and to be thriving  
 "in some ponds near Penzance" but I do not know of it.



*ESOCIDÆ*.—(THE PIKES).

- The Garfish. (*Belone vulgaris*). The Gerrick. The Greenbone. Bones of a most unpleasantly bright green, but the fish is nevertheless very good eating. Smells most disagreeably when caught. Assembles in shoals in the autumn. Common.
- Greater Flying-fish. (*Exocoetus exiliens*). Rare, but has been observed in Cornwall. There are two species of Flying-fish, one leaning to the Gurnards, and the other to the Mulletts. There is, I think, no doubt that the Cornish specimens belong to the Mullet alliance.
- The European Half-beak, (*Hemiramphus longirostris*) and Blunt-headed half-beak (*H. obtusus*) are of exceedingly rare occurrence. Indeed, it is not yet certain that they are distinct.
- The Skipper. (*Scomberesox saurus*). This fish is not common off the Coast of Cornwall, but is well known off the Welsh ports.

*SALMONIDÆ*.—(THE SALMON KIND).

- Salmon. (*Salmo salar*). Common in a few rivers and in the sea, off inlets into which fresh water falls.
- Bull trout. (*S. trutta*). Peal. Sea trout. This fish is often confounded with Salmon peal, which is the young Salmon. It is distinguishable by its blunter head, fuller tail, and redder and less flaky flesh. Couch (British Fishes) distinguishes Salmon trout from this fish, but not, I think, on sufficient grounds. Of slender Salmon (*s. gracilis*), I had an opportunity of showing a specimen to Mr Frank Buckland, and he at once pronounced it a sea trout. It seems probable that all our salmons may be ranged as salmon or sea trout in various stages of development.
- Trout. (*S. fario*). Common everywhere. I have known this fish in ponds to attain a weight of over 3 lbs. (very large for Cornwall), and I have seen fish of over 1 lb. taken in our smallest brooklets, but the ordinary run of the fish in its wild state taking the county through, is about 2 oz.
- Samlet. (*Salmo Samulus*). Parr. Distinguishable from trout in having its red spots on, or on each side of, the lateral line, instead of scattered over the back, and in having several


dusky bars running from the back across the lateral line towards the belly. It is a small fish, very common in some of the West Dartmoor rivers. It is recorded as frequently occurring in some of the rivers of Cornwall. The only Cornish specimen I myself have ever seen, came from the ponds at Tehidy.

American Lake Trout. (*S. Fontinalis*.) This fish has been recently introduced into the county, at Tehidy, as an experiment. It is said to attain considerable size, and to afford excellent sport.

*CLUPEIDÆ*.—(THE HERRING TRIBE).

Pilchard (*Clupea pilchardus*) is the base of one of the principal fishing industries in Cornwall. Without being a migratory fish (properly so-called) it swarms in from the deep sea in summer and autumn, and keeping in shoals or schools by day, it scatters at night, probably to feed. Shoals have been taken in excellent condition so late in the year as 24th December. A few years since a shoal was taken in the lower reaches of Truro river in the month of February, but in what condition they were, I do not know. I have, however, received pilchards cast on shore in the month of February, and they were utterly unfit for food. It is probable that the sardine is pilchard.

Herring. (*Clupea Harengus*). Large quantities of this fish are taken off our coasts in the fall of the year, but they are nowhere in Cornwall of sufficient importance to maintain a separate fishery.



fishes, and that no distinct fish occurs. In some years white-bait swarm on our coasts.

**Alice Shad.** (*Alosa vulgaris*). Damon (qu : Dame of the) herring. A large and beautiful herring of most delicate flavour. It is by no means uncommon, but is frequently confounded with herring proper.

**Twaité Shad.** (*Alosa finta*). Not so common as the Alice Shad, but like it, of excellent flavour, and often confounded with herring.

**Anchovy** (*Engraulis encrasicolus*.) This fish has been taken occasionally in St Ives Bay, but my experience of it is that it is not common.

#### GADIDÆ.—(THE CODFISH TRIBE).

**The Cod** (*Gadus morrhua*.) Common off all our coasts but rarely taken in good condition for the table. The best are those which have the deepest groove or depression at the back of the head, and the largest "belly," (i.e. greatest depth and distension of the stomach under the first dorsal fin.) Those that fail in this respect, are called by the fishermen, "churchyard cod" and are sure to turn out woolly and watery. No naturalist should ever allow the stomach of a cod to be thrown away without examination. Being bottomfeeders on crustaceans they are invaluable as collectors.

**Dorse** (*Morrhua callarias*.) This fish is by no means uncommon, but it is generally confounded with cod, to which it is very similar. A cod of rich red brown color over the back will probably turn out to be a dorse. There are external distinctions sufficient to mark the two species but the texture of the flesh is a certain guide. The dorse is firmer and less flaky than the cod, superior to the cod of our seas, but inferior to the "head and shoulders" of London. It also is a good collector.

**Haddock** (*Morrhua æglifinus*.) An excellent fish for the table in midwinter, but of most uncertain habitat. It frequents a rocky ground in large numbers for years, and then it suddenly leaves it, and is found in some new locality.

**Blind** (*Morrhua lusca*) Bib. Whiting pout. Blens. Very common, and when of 2 lbs weight and upwards excellent



for the table all the year round. It is despised on account of its boniness.

Power Cod (*Morrhua minuta*.) A miserable little fish, very much like the blind, but longer in proportion to its depth. It is common everywhere.

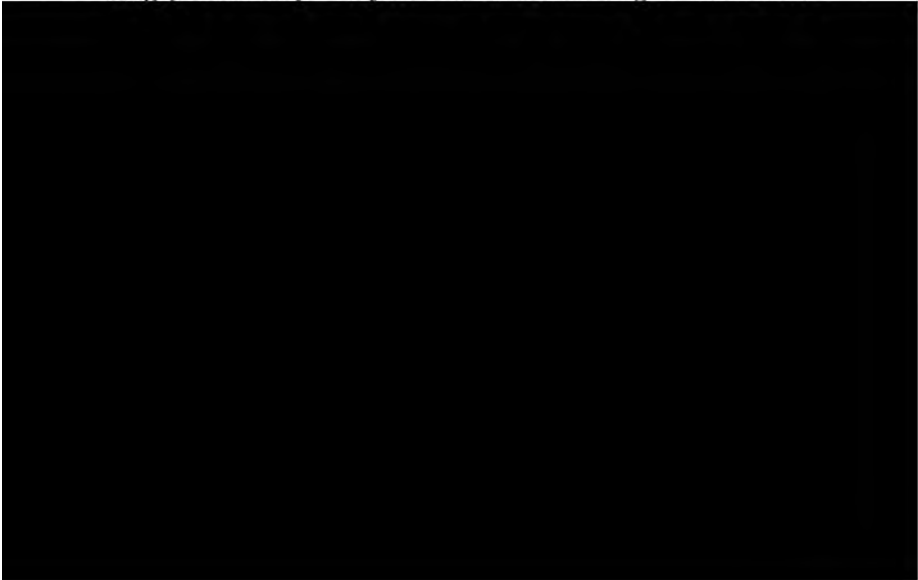
Whiting (*Merlangus vulgaris*.) This well-known delicacy is abundant off our coasts from September to March. The largest and best are taken off Polperro.

Poutassou (*Couch's Whiting*.) This Mediterranean member of the cod family has occurred twice off Polperro, but has not that I am aware of been recognised elsewhere in the County.

Pollack (*Merlangus pollachius*.) The whiting pollack. Peculiarly a Cornish fish. It is said to be almost unknown East of the Start. An excellent table fish all the year round, but best in winter. A fry of little pollack, about six inches long, will beat a similar dish of Cornish trout at any time.

Coalfish (*Merlangus carbonarius*.) Rauning (qu. Ravening or ravenous) pollack. This fish is common off all our coasts, and attains a very large size, (up to half a hundred weight) off the Land's End. Its flesh is coarser than that of the whiting pollack, but in small specimens it is quite as palatable. The straight white lateral line of this fish distinguishes it at once from the whiting pollack. Couch himself (*British Fishes*) identifies his "green pollack" with this fish.

Ling (*Lota molva*.) Very common and deserving of much more



- Three-bearded Rockling (*Motella vulgaris*.) Whistler. Very common in rocky pools. It is sometimes taken of a large size in deep water. It is considered a delicacy.
- Four-bearded Rockling (*Motella cimbria*.) A small rare fish.
- Five-bearded Rockling (*Motella quinquecirrata*.) A small fish. Common inshore. Very like the Whistler, but never of the size to which that fish attains.
- Mackarel Midge (*Motella glauca*.) A tiny fish. Usually to be found amongst shoals of "bait" (Launce, whitebait, &c.,) which swarm inshore in summer and autumn. Rare.
- Thompson's Midge (*M Coryphæna*.) Mr. Couch records this as having occurred in Cornwall.
- Lesser Forkbeard (*Raniceps trifurcatus*.) Tadpole fish. R. Jago. By no means uncommon; with an extremely unpleasant smell when fresh. Usually taken on hook and line.
- Greater Fork-beard (*Phycis furcatus*.) Hake's dame. Couch (Fauna) speaks of it as "not uncommon in winter;" but my experience of it is that it is rare. The more the pity, its flesh being extremely delicate, and much superior to whiting. Couch (British Fishes) mentions a Blennoid Forkbeard, but after seeing several specimens of Greater Forkbeard at all seasons of the year, I do not find that it can be distinguished from the ordinary fish out of condition.

*PLEURONECTIDÆ*.—(FLAT FISHES).

- Holibut (*Hippoglossus vulgaris*.) Lady fluke. This largest of the British flat fish, which not rarely runs to 8 cwt, is of frequent occurrence off our coasts. It is sometimes of a few pounds weight only. It is edible, but in my own opinion, not good.
- Long Rough Dab (*Hippoglossoides limandoides*, Gunther.) Is reported as having occurred off Falmouth.
- Turbot (*Rhombus maximus*.) Common. This fish is remarkably apt to take its colour from the sands in which it is feeding.
- Brill (*Rhombus vulgaris*.) Common. Very uncertain eating. About one in three is fit for the table.
- Carter (*Rhombus megastoma*.) Mary sole. Whiff. Lantern (because one can almost see through it). Common.

Mullers Topknot (*Rhombus hirtus*). Not well-known, but not uncommon. Its flesh is excellent. I do not think Block's Topknot (*R. punctatus*) has ever been taken in our seas, but the two fish are so much alike that they may well have been confounded. Eckstrom's Topknot (*R. Norvegicus*: Gunther) has been taken in the Bristol channel. Whether that is Cornish water is doubtful.

Megrim (*R. Arnoglossus*) Scald fish. This is not a common fish, and it is not, I think, certain that it is more than a variety (may be the partly developed young) of the "Carter." Gunther calls it "Arnoglossus Lanterna." Mr. Couch, (British Fishes), in describing the megrim, refers to some specimens of "Arnoglossus lophotes" which probably occurred at Plymouth, but I understand his conclusion and that of Mr. Yarrell to be that these were accidental varieties of the principal fish.

Plaice (*Platessa vulgaris*). Of uncertain occurrence, and very variable value for the table. In observations in Mount's Bay, extending over 25 years, I have remarked that when the Masked Crab (*Corystes Cassivelaunus*) is common in the early spring, Plaice in the summer, and Red Mullet in the autumn, are always abundant. The Plaice from a hard close killas sand are usually good edible fish. Those from a loose granite sand are valueless.

Dab (*Platessa limanda*). Very common, and by no means a bad fish.

Small Dab (*Platessa minor*) Large Dab (*Platessa maxima*)



Lemon Sole (*Solea pegusa*). Couch (British Fishes) mentions one specimen as having occurred at Plymouth, and I have a record of the occurrence of two (on the same day) at Porthcurnow under the Logan Rock. It is rare.

Solenette (*Monochirus linguatulus*). Little Sole. A fish rarely seen, but yet a common one. At its largest size it is so insignificant, that the trawlers who take it fling it overboard as valueless.

*CYCLOPTERIDÆ*.—(SUCKING FISHES).

Lumpfish (*Cyclopterus lumpus*) Lump sucker. Not uncommon. The blue fish being the female, and the red one the male. This fish is remarkably tenacious of life. (Couch abandons the Coronated Lumpfish of the Fauna.)

Sea Snail (*Liparis Vulgaris*). Rare. Has been taken at Falmouth. Also called Butterfish.

Montague's Sucker (*Liparis Montaguï*). Common. Probably the Network Sucker (*Lepidogaster bimaculatus*: Gunther) is an accidental variety.

Cornish Sucker (*Lepidogaster cornubiensis*) "The Sucker." Common under stones and in small pools by the seashore. The double spotted Sucker (*L. bimaculatus*: Yarrell) is probably an accidental variety of the Cornish Sucker. It cannot be distinguished from it in a satisfactory manner.

It must, however, be remarked that Gunther and Yarrell apply the term "*bimaculatus*," the one to a fish allied to Montague's Sucker, the other to a fish allied to the Cornish Sucker; and with such authorities as these in view, it may well be that a species exists, intermediate between Montague's and the Cornish Sucker, yet allied to both.

The Sucking Fish (*Echeneis Remora*). Properly belonging to the family *Echeneidæ*. Has occurred attached to Codfish in the Bristol Channel, and has been landed in fresh condition taken off the body of a Shark captured in the Bay of Biscay. These are its only claims to be called a Cornish fish, but it is a pure parasite, and I have no doubt it is to be found (if sought for) on the bodies of some of the large fish occasionally caught, especially attached under the pectorals.

*MURÆNIDÆ*.—(THE EEL TRIBE.)

Sharp-nosed Eel (*Anguilla acutirostris*). The common eel of the county. It is not unfrequently a permanent resident in salt water, but not, so far as I have observed, at any great distance from the shore.

Broad-nosed Eel (*Anguilla latirostris*). Couch (Fauna) speaks of this as "less common than the sharp-nosed eel" (of course in Cornwall). The only specimens I have seen of it have been from the fresh water pond at Tresco in the Scilly Islands. The largest of these weighed 6lbs. 8ozs. when I weighed it, but it wasted 6 ozs. on its way to London, where a cast of it was taken by Mr. Buckland.

The Snig Eel (*Anguilla mediorostris*). Is mentioned by Mr. Couch as having occurred in Cornwall, but I cannot see in what way the Snig differs from what a small sharp-nosed Eel would be.\*

Conger (*Conger vulgaris*). Common everywhere. Varies in its colour with the ground it inhabits. It differs from the fresh water eels in having its upper jaw longer than its lower. There are two varieties, but whether more than accidental, I cannot say. One thick at the "shoulder," and of which a specimen of five feet long would weigh close on 60lbs.; the other thin at the shoulder, of which a specimen of 5 feet long would not exceed 30lbs.

Morris (*Lentocentrus Morrisii*). Mr. Couch records this fish in



*ANGUILLIDÆ*.—(THE LAUNCE FAMILY.)

The Launce (*Ammodytes tobianus*). The ordinary "bait" of our fishermen.

The Sand Launce (*Ammodytes lancea*). Very common. Larger than the Launce; buries itself in wet sands, whence it is fetched out by hooks made for the purpose, it being much too toothsome to be left in its retirement. On comparing Yarrell with Couch and Gosse, it will be found that there is still confusion over this family.

*SYNGNATHIDÆ*.—(PIPE FISHES.)

Great Pipe Fish (*Syngnathus acus*). Common.

Broad-nosed Pipe-fish (*S. Typhlé*). About as common as *S. Acus*.

Ocean Pipe-fish (*S. æquoreus*). The æquoreal Pipe-fish. In some years a common fish.

Snake Pipe-fish (*S. Ophidion*). Most abundant occasionally.

Worm Pipe-fish (*S. lumbriciformis*). A constant visitor, but it is rarely caught.

Sea-horse (*S. Hippocampus Linnæus*). This fish has, I believe, been taken in Plymouth Sound. The closely allied species *S. biaculeatus* has been taken in the Baltic and in the Chinese seas, and it will be hard, indeed, if we do not some day stop a specimen on a visit to its relations.

Blunt-tailed Pipe-fish (*S. brevipinnatus*). In October, 1872, a *Syngnathus* was captured in Mount's Bay, which differed from all the known species in a most remarkable manner. It was described in the Zoologist of October, 1872, second series, No. 85, p. 3274, and received the above name.

*GYMNODONTIDÆ*.—(THE SUNFISH FAMILY.)

Four-horned Trunk-fish (*Ostracion quadricornis*. Linnæus.) One specimen taken off Mevagissey.

File Fish (*Balistes capricornis*). Taken off Port Loe in 1865.

Pennant's Globe Fish (*Tetrodon Pennantii*). Rare. Of this singular fish it should be noted that its "globe" or spinous bladder is inflated by the action of involuntary muscles. I cannot of course say that it may not also be inflated voluntarily.

Sunfish (*Orthogoriscus mola*). Common during every summer.

Oblong Sun-fish (*Orthogoriscus oblongus*). Rare.

*STURIONIDÆ*.—(THE STURGEONS.)

Sturgeon (*Acipenser sturio*). Rare.

*SQUALIDÆ*.—(THE SHARK TRIBE.)

The Nurse (*Scyllium stellaris*). The Nursehound. The Roughhound. A bottom feeding shark of considerable size, reaching usually to  $\frac{3}{4}$  of a cwt. Not uncommon.

The Morgay (*Squalus catulus*: Linnæus). The small spotted dog fish. The commonest of our small sharks. A pest to fishermen, but makes good soup, and does not eat badly when salted.


The Black-mouthed Dogfish (*Scyllium melanostomum*). The eyed dog-fish. Only one specimen on record as Cornish or even British. Caught in 1834.

Six-gilled Shark (*Hexanchus griseus*). Rare.

White Shark (*Squalus Carcharias*: Linnæus.) I place this in the list in deference to the authority of Mr. Couch, but I can find no record of the appearance of this shark in Cornish waters.

Blue Shark (*Carcharias glaucus*). A very common pest of our fishermen.

Thrasher (*Carcharias*, or *Squalus vulpes*). Sea Fox. Fox Shark. By no means uncommon. A few are taken every year by the mackerel and pilchard drivers.



this fish, one a ground shark, and the other a "round" or swimming fish.

The Basking Shark (*Squalus maximus*). Our largest British fish. Not uncommon in summer.

Pennant's Basking Shark (*Selachus maximus*: Prof: P. Panesi). A Mediterranean fish. Very rare. It has been wrongly described as the Rashleigh Shark and the Broadheaded Gazer. It feeds as the whale does on medusæ or some other exceedingly small marine productions, which it strains through a comb-like arrangement in its gills. Its teeth are rudimentary.

The Hammer-headed Shark (*Squalus zygena*: Cuvier). Very rare.

The Monkfish (*Squatina angelus*). The Angel fish. Common. Viviparous.

The Centrine (*Squalus centrinus*: Bloch). The first British specimen of this fish was taken off the Wolf Rock in the spring of this year (1877).

Mr. Couch has, so far as I can see, abandoned the Lewis Shark (*Squalus Lewis*) in his "British Fishes."

#### RAIIDÆ.—(THE RAY TRIBE.)

The Skate (*Raia batis*). Common. I do not think the Flapper Skate can be distinguished from it.

The Long-nosed Skate (*Raia mucronata*). Not uncommon in deep water.

Burton Skate (*Raia oxyrhynchus*). Not uncommon in deep water.

The Thornback (*Raia clavata*). Common. I do not think the Starry Ray can be distinguished from it.

The Homelyn (*Raia maculata*). This and the Thornback are our chief edible rays. The Homelyn beyond question includes the Cuckoo Ray of Couch. I have seen them of all gradations from plain Homelyn to most brilliant Cuckoo.

Small-eyed Ray (*Raia microcellata*). The Painted Ray. The Owl. Held in high esteem as an article of food by those who know it. It is a very local fish, but where it is found it is abundant. For instance, off Pra-sand in Mount's Bay, quite three-fourths of the rays caught are "Owls."



- The Sandy Ray (*Raja circularis*). I record this Ray in deference to the authority of Mr. Couch, but I much doubt whether it is not an accidental variety of the Homelyn.
- The Torpedo (*Raja torpedo*). The Cramp Ray. The Electric Ray. Is not uncommon, and yet is rarely observed, because most fishermen cut it away as soon as they see it.
- The Sting Ray (*Trygon pastinaca*). The Fire-flaire. Is of rare occurrence.
- The Eagle Ray (*Myliobatis aquila*) is recorded as having occurred once off the coasts of Cornwall.

*PETROMYZIDÆ*.—(THE LAMPREYS.)

- The Sea Lamprey (*Petromyzon marinus*.) Common.
- The Lampern (*P. fluviatilis*). A river fish. Is said by Mr. Couch to be "Common," and no doubt it is so in the eastern part of the county. With it, should, apparently, go the Silver Lamprey and Planer's Lamprey; but I am now making my conclusions from written descriptions and not from observation, and cannot therefore speak with confidence.
- The Mud Lamprey (*Ammocetes branchialis*). The Pride. Blind Lamprey. Common.
- The Mixine (*Gastrobranchus cæcus*). The Borer. The Hag Fish. Rare.
- Lancelet (*Amphioxus lanceolatus*). A tiny fish, and very rare. All small fish of the deep sea are rare. They escape observation.

I have now closed my list, having followed, as I have before

excessive waste which goes on in this department. We depend for our main supply on four families\*—the mackerel tribe, the herring tribe, the flat fish, and the cods; but it is only the well known members of these families that are eaten. If a rare specimen occurs, it is thrown away, but yet it is certain† that every member of each of these families is not only edible, but good eating. Indeed, with the exception of the larger sharks, the sunfishes, and the globe-fish, there is not, in my opinion, based on an extensive experience, a single British fish which is unfit for food under some form of cookery or other. Whilst of the sharks and rays I can say that their cartilaginous bones under the process of stewing, dissolve into a strong jelly. I suppose this may be so of the globe-fish and sun-fishes, but I do not know it. But it is not only in the fish which we throw away that we make our waste, but in the method of dressing the fish which we cook. We boil turbot and sole, and the water in which they are boiled is (and correctly) thrown away; but if instead of boiling them we dressed them by the process of steaming, we should save from them a quantity of very rich jelly. And then again, how very rarely do we make any use of fish liver! the good housewife who will boil down the bones and scraps of any meat to make stock for soup, will throw away fish bones and scraps with complacency, never recollecting for a moment that fish soups are as good as any other soups, and not aware perhaps that the stock of most of the queen of soups—turtle soup—(a soup by the way wholly of marine origin) when used for public dinners or in large hotels is made from conger. The subject is worthy of consideration. We throw away a third part of our fish, and waste a third part of those which we consume.

THO. CORNISH.

*Penzance.*

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\* It will be observed that I confine myself to the supply of salt-water fish, I say nothing of Salmon and other fresh water fish; but I apprehend that they are by no means so important a branch of fish supply as the smallest of the families which I have named. The "Gurnards" or the "Conger" are, perhaps, quite equal to the salmon as a source of general fish supply.

† I except Tadpole Fish. I have never tried it, but, its strong smell notwithstanding, I see no reason against its being wholesome food.

## CRUSTACEA.

*Revised and added to by C. Spence Bate, F.R.S.*


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IN complying with the request of the Council to revise the late Mr. Jonathan Couch's list of Crustacea in his Cornish Fauna, I have endeavoured to retain as much as possible of Mr. Couch's words, and to collect from books and other sources the information that he communicated to various authors on this branch of natural history.

I have, moreover, included any new forms that have, since the publication of his Fauna, been published as having been found in Cornwall; and have added from the History of the British sessile-eyed crustacea, a list of all the animals of that sub-kingdom that have been found on the coast of Cornwall.

The original portion of Mr. Couch's Fauna will be distinguished by inverted commas.

It will be seen that the Cornish Crustacea exhibits a very large proportion of the known British forms; and considering the few places as well as naturalists that have been engaged in the observation of these animals, I think there can be little doubt but that many other forms may yet be added to the local and



feelers, and eyes separately on footstalks or sessile. The mouth formed by the adaptation of several pairs of appendages varying in separate orders to assist in manducation. The legs with several joints, some of the higher groups being variated into prehensile appendages. Vent at the extremity of the animal."

"The stalk-eyes Crustaceans possess a carapace or shelly crust above the thorax or *Pereion*, within which the principal organs of life are protected, the branchiæ or gills for breathing are not branched; five posterior pairs of appendages belonging to the thorax or *Pereion* only formed for walking.

"They are arranged by Dr. Milne Edwards in his *Histoire des Crustacés*, 1830, into three great sections, of which the separate characters are"

"BRACHYURA or short-tailed Crabs, having the pleon or abdomen, vulgarly called the tail, slightly developed, having none of its appendages adapted for swimming and destitute of fan-like caudal plates," or uropoda.

"ANOMOURA, abdomen or pleon well developed, with a portion bent under the thorax or pereion, with terminal caudal plates" or uropoda.

"MACROURA, abdomen or pleon well developed and extended, having paddles (pleopoda) beneath and terminal fan shaped uropoda or caudal plates."

The Order of the Brachyura is again divided into the following families, *Oxyrhynchidæ*, *Macropodidæ*, *Maiadæ*, *Parthenopidæ*, *Canceridæ*, *Portunidæ*, *Pinnotheridæ*, *Grapsidæ*, *Leucosiadæ*, &c.

#### MACROPODIDÆ. (SEA SPIDERS.)

GENUS STENORHYNCHUS.—*Lam.*

"Second pair of legs much longer than others; the stalk of the external antennæ inserted before the level of the eyes, of which the footstalk is very short."

STENORHYNCHUS TENUIROSTRIS—*Leach*—*Smaller Sea Spider.*

" LONGIROSTRIS—*Couch's Cornish Fauna*

"Common at the depth from two to twenty fathoms, often taken in crab-pots."

" STENORHYNCHUS PHALANGIUM—*Pennant*—*Long-legged Spider Crab.* "Common at the mouth of rivers—*Leach*; off the south coast of Cornwall. *Bell*, C.S.B.

GENUS ACHÆUS.—*Leach*.

"Snout not much lengthened, and on each side leaving uncovered the insertion of the stalk of the external antennæ. The terminal joint of the two posterior pairs of legs is large, compressed and falciform."

ACHÆUS CRANCHII.—*Leach*.—*Cranch's Spider Crab*.—Not common.

Deep water among weed, and from its small size probably frequently overlooked."

GENUS INACHUS.—*Fabr*.

"Differing from the two former genera in having retractile eyes capable of extensive motion, second pairs of legs thrice as long as the first-frontal portion of the carapace; terminal portions of the four hinder pairs similar and slender."

INACHUS DORSETENSIS.—*Leach*.

„ SCORPIO.—*Couch's Cornish Fauna*—"Scorpion Spider Crab".—Commonly taken in crab pots within a few miles of the shore at all depths."

"INACHUS DORHYNCHUS.—*Leach*—*Feeble Inachus*.—Common, not unfrequently found on board crab boats."

"Except in the rostrum it has much of the aspect of *Stenorhynchus longirostris*, but is less common."

INACHUS LEPTOCHIRUS.—*Leach*.

„ LEPTORHINCHUS—erroniously given by *Edwards* and *Couch*—*Small Snouted Inachus*.—Taken off the coast of Cornwall by *Cranch*.

GENUS HYAS.—*Leach*.

"Distinguished from *Pisa* by the absence of the strong spine which in that genus forms the anterior portion of the circle of the orbit; and by the second member of articulation of the outer antennæ being flattened and widened on the outer side.

*HYAS ARANEUS*—*Linnaeus*;—*Spider Hyas*.—*Milne Edwards, Hist. des Crust., Vol. 1, p. 312*; *Leach, Malac. p. 121*; *Pennant, p. 19, fig. 16*.—Off the S. coast of Cornwall. C.S.B.

*HYAS COARCUATUS*.—*Leach, Mal. pl. 21*; *Milne Edwards, Hist. des Crust., Vol. 1, p. 312*.—Off the S. coast. C.S.B.

Although Mr Couch wrote in the previous edition of his Cornish Fauna that he was not acquainted with either of these species and therefore supposed them not to be common, it is recorded as having been taken off the Cornish Coast upon his authority in Bell's crustacea. And he also mentioned that specimens taken off the coast of Cornwall are in the museum of the Athenæum at Plymouth.

GENUS MAIA.—*Lam.*

"The stalk of the external antennæ inserted into the internal angle of the orbit, and uncovered; nippers of the hand slender and pointed."


*MAIA SQUINADO*—*Herbs, Corwich or Skerry*.—*Milne Edwards, Hist. des Crust., Vol. 1, p. 327*.

Mr. Couch in the previous edition of the Cornish Fauna mistook the Mediterranean species, *M. Verrucosa*, for this, but it differs in having tubercles instead of spines on the dorsal surface. Mr. Couch says that this species "in its season is the most abundant species of the family, and by far the largest, sometimes weighing as much as five pounds, and the carapace measuring from nine to ten inches in length; so that it is commonly used as food, though only by poor people and fisher-boys, who find in it a delicate meal. Its not tempting form and the small size of the legs conspire to exclude it from the tables of the rich."

The information in Bell's account of this animal in his British stalk-eyed crustacea is mostly from the pen of Mr. Couch, and I therefore do not hesitate to transfer it in full. He says "This is the most abundant of all the crabs found on our coast, but it does not make its appearance as early in the season as the

common crab, the lobster, or indeed any other; it is rarely found earlier than May, but from that time till the end of the fishing in August or September, these crabs make their appearance in vast numbers, to the great vexation of the fishermen; for it is found that from the time these begin to enter the pots, the more valuable kinds considerably decrease in number; and this is supposed to arise from their restless activity. No sooner are they in the crabpot than they are continually in motion, scrambling from one part to another, and in this way frighten the crab and lobsters and prevent them from entering.

“In the spring and early part of the summer they lie concealed beneath the sand in deep water. About May they leave their places of concealment, but never come into shallow water, as does the common crab. The latter is often found in crevices of rock or beneath stones left by the receding tide, but this is never the case with the *Corwich*. They shed their spawn about August or September at some short distance from the shore, most probably in the sand. In this too they differ from the common crab, for even when the spawn is quite mature for casting, they enter the pots as readily as at any other time, whilst on the other hand it is a very rare occurrence to catch the common crab with spawn, unless it be with a dredge net. It would seem that either they grow fast, or that the young differ considerably in their habits from the larger ones; for whilst it is very common to find specimens measuring nine or ten inches in length of the carapace, it is very rare indeed to get one less than three inches, and a fisherman tells me that after many



the position of a straight line. I could detect no spine on the anterior part of the carapace, which was quite smooth, but marked with dots. The eyes are sessile and large, the claws, particularly towards the extremity, covered with minute hairs."

The figures of the young or zœa form are given in Mr. Bell's work from Mr. Couch's drawings, who says that an ordinary sized Corwich bears at one time upwards of seventy-six thousand eggs.

### *PARTHENOPIDÆ.* (PARTHENOPIANS.)

#### GENUS, EURYNOME.

"Eyes retractile; joint of the hand more or less triangular and armed. First joint of the outer antennæ fused with the frontal plate, and giving insertion to the next articulation on the fore part of the level of inner canthus of the eye."

*EURYNOME ASPERA.*—Rough Eurynome.—*Milne Edwards, Hist. des Crust., fig. 1, p. 357; Leach, Malac., p. 17; Pennant, p. 9, fig. 20; Bell, Hist. Brit. Stalk-eyed Crust., p. 46.*

There is a specimen in the museum of the Athenæum at Plymouth.

"The length of the legs in this family of Crabs necessarily leads to slowness of motion; but they are well fitted to a residence among rocks and stones covered with seaweed, among which they stride with little difficulty. In the winter, they become almost, if not altogether torpid, concealing themselves at this season either in deep crevices of rocks or embedded in the soil; for the Corwich crab has been observed when caught at the time of its first activity in April to have the inequalities of its carapace covered with the mud of the bottom. It is perhaps at this period of repose that the crops of seaweed and corallines (*Sertularia* &c.) fix themselves, as they are often seen beautifully adorning them; shells of different species, but especially oysters and mussels, are also found adhering, and on the smaller kinds, as of the Genera *Inachus* and *Pisa*, and sponge will grow so luxuriantly as to conceal the whole carapace with tufts from the legs to the extremities.

"In the spring the spider crabs appear in water of the depth of a few fathoms; but as the weather grows warmer they approach the shore and in summer climb the rocks, so as sometimes to be left by the receding tide. At the season of the greatest activity, the corwich crab becomes so abundant that as no one thinks of



purchasing them they are regarded as a great annoyance by the fishermen; for it is found that when they occupy a crab-pot no lobster will enter it. I have been informed of nearly a cart load having been taken at one haul of a ground seine, and singularly enough the whole were found to be females. It is indeed a matter of general observation that the females exceed the males in the proportion of perhaps 10 to 1; and during the summer they are all well laden with spawn, which having been carried beneath the flap as in other crabs, for several months, for the sake of full exposure to the water and light, are dropped in some concealed places, where they elude observation, for I have not succeeded in finding one of a very small size." This may be accounted for by the fact that when in the zœa form the young animal swims on the surface of the sea in a form unlike the parent.

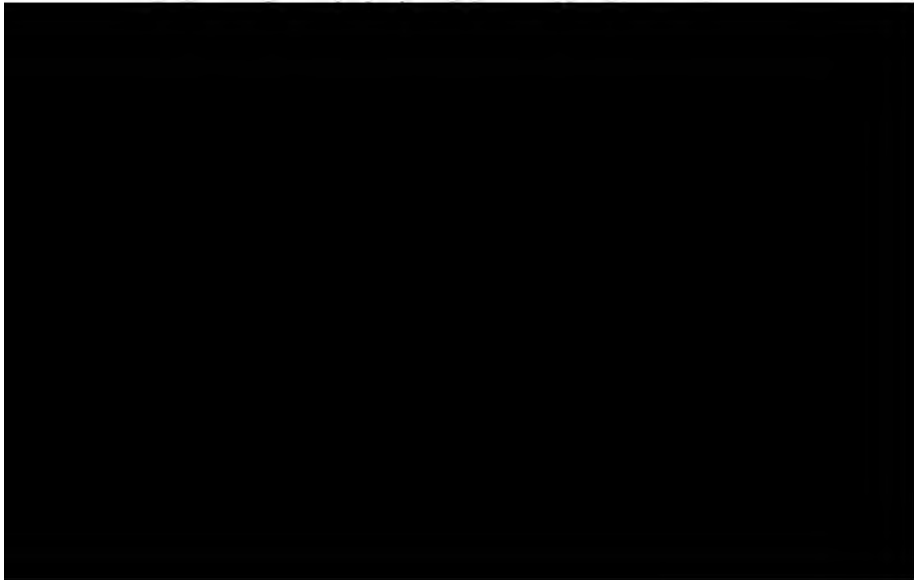
*CANCERIDÆ*.—(CANCERIANÆ.)

GENUS, *XANTHO*.—*Leach*.

„ *Zantho*.—*Couch*.

Carapace large, horizontal, a narrow fissure dividing it into two portions, the separating line furrowed; cavities of the antennæ transverse, separated by a slender partition, antennæ short.

*XANTHO FLORIDUS*—Furrowed Crab.—*Leach, Malac. pl. 11; Milne Edwards, Hist. des Crust., fig. 1, p. 294; Bell, Brit. Stalk-eyed Crust., p. 51.*



**XANTHO TUBERCOLATA**.—*R. Q. Couch, Bell's Brit. Stalk-eyed Crust., appendix p. 359.*

This species, which was first described by Mr. Bell in his book, on the British Crustacea, was added to our Fauna by the late Mr. R. Q. Couch, of Penzance, son of the author of the first edition of this report.

Mr. Couch says that it appears to prefer deeper water than the other two species, as he found it repeatedly in crevices of *Eschara foliacea* in the deep water off the Runnell Stone, in Mount's Bay. In the summer it approaches the shore and is found under stones. It spawns in June. Mr. Bell adds "the name *tuberculata* has been given to the species by its discoverer, from whom and from his father, Mr. Jonathan Couch of Polperro, I have had so many claims upon my acknowledgments for their intelligent and ready assistance in the progress of the present work."

GENUS, **CANCER**.—*Lin., Leach, Bell.*

„ **Platycarcinus**.—*Edwards, Couch.*

Carapace approaching to a transverse oval without furrows.

**CANCER PAGURUS**.—Edible Crab.—*Linn., Leach, and Bell Brit. Stalk-Eyed Crust., p. 59.*

**Platycarcinus pagurus**.—*Edwards, Hist. des Crust., t. 1, p. 413; Couch, Cornish Fauna, p. 68, 1838.*

This is the species so highly esteemed for the table, and for which a regular fishery is carried on. The male, called the Stool crab, is much the larger, not uncommonly weighing a dozen pounds, whilst the female, termed the Bon crab, is rarely half that size. Although this crab is somewhat affected by cold weather, so that it is most abundantly caught in summer, its activity is not diminished by it, and some may be obtained at all seasons. The fishery, therefore, is more influenced by the danger to which the pots set to take them are exposed in stormy weather, than by the absolute scarcity of the crabs. The haunts are along the edges of the rocks, in situations varying from low water mark to about 20 fathoms, and the selection is perhaps as much influenced by the facility of hiding or burrowing, as by the supply of food. The Bon crab begins to breed when about three inches across the carapace; and the spawn after remaining long attached to the parent, is buried beneath some shelter at all seasons of the year; but when engaged in this duty the female feeds


but little and commonly hides herself, few of them are taken in the pots. Fishermen mention such instances as somewhat remarkable, though most other crustaceans are familiarly taken with the "pea" attached.

The eggs are commonly shed while the parent is hid in the sand; and the young, of very small size, may be found beneath stones at low water mark; but there are some differences in this, as in some other of the habits of the different sexes; for among the multitudes of young found as described I have never been able to discover a female.

The trap made use of in taking crabs and lobsters is made of wicker work, in the form of the ordinary dome-shaped mouse trap, with the difference that the only entrance is at the top, and that the bottom is immovably joined to the structure. It is about two feet and a half high, and the bait is fastened within, between the neck of the entrance and the sides, by wooden skewers, so as to be seen at the greatest distance.

The skate and other fishes not generally sold in the market are used for bait, and it is found that the freshest only will attract the crab, whilst for lobster it is best when hung for several days to become tainted.

The pot is weighed down by a couple of stones fastened within, and the place is marked by a line with single corks along its course and a buoy at the end. The pots are *hauled* or examined every morning, at which time they are rebaited, and the crabs and lobsters conveyed to the store pots, which are much larger than the others, and are suspended near the surface by a small



it is essential, and I have been informed that when a vessel has been detained in harbour, it has been found necessary to go to the open sea and back to renew the water in the hold that the cargo may be kept alive.

The master of the lobster smack has a method of dealing with the fisherman that must not a little redound to his own advantage. If the lobster exceeds the length of eleven inches from snout to tail it is considered a full size fish or tale, of which the price was (in 1833) 10s. per dozen; but all that fall short of that length are regarded as only amounting to half the price.

A crab of the largest size can pass for no more than half the value of a full lobster, but if less than eight inches across the shell or carapace, they are half of a full or tale crab, and none are admitted that measure less than four inches.

Crab fishing is followed chiefly by the poorer fisherman, or by those whose activity has given way to the infirmities of age. It was formerly more profitable than now, and seems to be gradually decreasing. The lobster smacks that pass along the Cornish coast collecting the produce of the fishing of the two or three preceeding weeks, are mostly from Southampton, but the destination of the cargo seems to be the port of London.

In the report for 1843, of the Royal Polytechnic Society, Mr. Couch published a paper on the process of exuviation in crabs and lobsters, and again in the report of the same society for 1854, he published "a particular description of some circumstances hitherto little known, connected with the process of exuviation in the common edible crab;" in the latter communication he demonstrated the manner in which the larger claws split previously to the old shell being cast.

In the report of the recent commission (1877) on crabs and lobsters, the evidence went to prove that there was no decrease in the quantity of animals taken but that there is a larger demand, and a greater number of fishermen. The price of crabs is now (1877) 15s. per doz. for males, and 3s. per doz. for females.

CANCER INSOCRENATUS.—Couch, *Cornish Fauna*, 1838, p. 69-70.

"Carapace large, oval, somewhat elevated in the middle; points of the nippers not spoon-shaped. Legs short, compressed, those which are prehensile furnished above with a crest formed of a

row of spines or tubercles; terminal portion of the walking legs short and pointed.

No British example of this species has hitherto been known; but a specimen has come to my hands that belongs to this section, though I have not been able to refer it to any known species.

It was found in a crab pot in June, 1837, and though of small size, appearing to the fisherman to be of rare occurrence, it was reserved for my inspection. It was scarcely the fourth of an inch across the carapace, the form and colour resembling those of the common edible crab, but the antennæ were covered with small wavy protuberances. On the margin between the ocular cavities were five segments (lobes) the central most projecting; on the lateral margin were nine crenations, each, as those between the eyes, distinctly but finely notched. Antennæ, small, fine, simple, and with the palpi resembling those of the common crab. Hand claws and walking legs short, the two outer segments (joints) with a serrated crest, and the finger also notched at its root, walking legs with short bristles.

It may be that it is not uncommon, as its small size may easily cause it to be overlooked."

Most probably this is the young of some known species. I am not aware that it has been seen by any one but Mr. Couch. Bell does not notice it. It appears to me to resemble *Pilumnoides* of Edwards and Lucas.

*Canis Britannicus*



GENUS, *PIRIMELA*.

"Carapace rounded in front, and about as wide as long, strongly embossed, and toothed at the sides, the third articulation of the inner foot-jaws giving insertion to the next on its internal edge."

Mr. Bell defines the genus as being most easily recognised from all other *Canceridæ*, in the circumstance that the external foot-jaws are advanced over the epistome to the antennary cavities.

*PIRIMELA DENTICULATA*.—*Leach. Malac. Brit. pl. 3; Milne Edwards, Hist. des Crustacea, t 1, p. 424.*

"This is the only known species of the Genus, and is not common."

It has been taken all round our southern coast and in one or two places in Ireland. It is a species that is not littoral, since it is generally taken in the trawl refuse.

*PORTUNIDÆ*.—(SWIMMING CRABS.)GENUS, *CARCINUS*.

Terminal articulations of the hindmost legs lancet shaped flat and broad, carapace broader than long, front advanced.

*CARCINUS MENAS*—Common Harbour Crab.—*Leach, Malac. pl. 5; Pennant, pl. 2, fig. 5; Milne Edwards, Hist. des Crust, vol. 1, p. 434.*

One of the commonest crabs of our shores, where it hides under stones on the beach but never goes far from land. It is a hardy species, easily kept in confinement for the sake of observation, and has even survived the being kept in fresh water. It lives in fresh water streams where the sea enters.

The development of this crab has been observed through all its stages from the zoea to the adult form, and it seems to be one of progressive morphology.—(Vide Phil. Trans.)

GENUS, *PORTUMNUS*.—*Leach, Bell.*

"*Platyonychus*.—*Edwards, Hist. des Crust., V. 1, p. 434; Couch.*

"Hinder legs with a wide and oval joint; corresponding part of the other legs straight and unfit for swimming."

This definition of Couch's is scarcely sufficient to determine the Genus from that of *Portunus*. *Portumnus* is easily detected by

the form of its carapace, which is Lyre-shaped, and is as long as it is broad.

Mr. Bell considers it to be a distinct Genus from *Platyonychus*, but I doubt if he has made out more than a specific separation, even if he has good evidence of that.

PORTUMNUS LATIPES.—Wide Foot.—*Pennant*.

*Platyonychus latipes*—*Edwards, Hist. des Crust., t 1, p. 436; Couch's Cornish Fanna, p. 71.*

*Portumnus variegatus*—*Leach, Bell, Hist. Stalk-Eyed Crust., p. 85.*

It is found at low water mark on sandy beaches, in many places, where it burrows. Though not common it is tolerably abundant where taken.

GENUS, POLYBIUS.—*Leach*.

Carapace nearly circular, much depressed, anterior margin dentated, posterior pair of legs having the terminal joint flattened for swimming.

POLYBIUS HENSLOWII.—Nipper or Henslow's Swimming Crab.—

*Leach, Malac. Brit., t. 1, 9; Milne Edwards, Hist. des Crust., t. 1, p. 439.*

"This, more than any of the others, is a swimming crab; for whilst the other British species of this family are only able to shoot themselves along from one low prominence to another, the nipper crab, as our fishermen term it, mounts to the surface over the deepest water, in pursuit of its prey, among which are numbered the most active fishes, as the Mackerel and Rauning Pollock, the skin of which it pierces with its sharp pincers, keep-

The foregoing passage has been quoted at length in Bell's *Stalk-Eyed Crustacea*, p 118.

GENUS, PORTUNUS.—*Leach*.

Terminal articulation of the posterior legs formed flat for swimming. "Moveable stem of the outer antennæ composed of two articulations, and inserted on the same line with the eyes and inner antennæ; their basilar articulations fixed in front and entirely separating the orbit and cavity of the antennæ."

PORTUNUS PULBER.—Velvet Crab.—*Leach's Malac.*, p. 16; *Milne Edwards, Hist. des Crust.*, t 1, p. 431; *Bell's Brit. Stalk-Eyed Crust.*, p. 90.

*Cancer velutinus*.—*Pennant*, pl. 4, fig. 8.

"This is the largest British species of the family, sometimes measuring four or five inches across the carapace. It is also the most active and fierce, running with great agility on the appearance of danger, but stopping and assuming the attitude of defence when closely pressed. The largest keep in water at the depth of a few fathoms, and the smallest about low water mark, among stones, beneath which they shelter themselves."

Writing to Mr. Bell Mr. Couch says:—"It seizes an enemy suddenly and holds him with tenacity."

Mr. Bell says "that he has occasionally seen it brought to the London market with *Carcinus Menas*, and it is taken in large quantities on the French coast as an article of food."

A friend residing in the Channel Islands informed me that it is preferred in that locality as a greater luxury than the common edible crab.

PORTUNUS DEFURATOR.—Cleanser Swimming Crab.—*Linn.*, *Pennant*, *Leach Malac.*, pl. 9; *Bell Brit. Stalk-Eyed Crust.*, p. 90.

*Portunus plicatus*.—*Milne Edwards, Hist. des Crust.*, t 1, p. 442; *Couch's Cornish Fauna*, p. 71.

"Common, with much of the habits of the last species. There is some difficulty in assigning the proper synonyms, to this and the two following species, which are described as inhabiting our coasts, and it is probable that we have one or more to which none of the descriptions apply. They are all termed harbour or Mary crabs, and all exceedingly ravenous, fastening eagerly on any animal substance that comes within their reach."



It ranges from ours and the Irish coast to the Mediterranean sea, where it was first observed by Risso at Nice.

PORTUNUS LONGIPES.—Risso.—*Milne Edwards' Hist. des. Crust.*, t 1, p. 445.

Portunus dalyelii.—*Spence Bate, Ann. Nat. Hist.*, 1851, p. 320, t xi, fig. 9.

This species was taken first off the coast of Cornwall, by Prof. Ed. Forbes and Mr. McAndrews, and afterwards at Falmouth by Mr. Cocks, and at Penzance by Mr. R. Q. Couch.

Professor Bell says that it is doubtless the same species as that described as *P. dalyelii*, l. c. by Spence Bate in the *Ann. Nat. His.* for 1851, which he took off the coast of South Wales. But certainly the Welsh species is more pronounced in its character than the figure given by Prof. Bell.

PORTUNUS MARMOREUS.—Marbled Crab.—*Leach, Malac.*, pl. t viii; *Milne Edwards, Hist des Crust.*, t 1, p. 442.

Cancer Depurator.—*Pennant*, pl. 2, fig. 6.

This species receives its name from the beautifully coloured and variegated carapace, which is more conspicuous in the males than in the females.

PORTUNUS HOLBALUS.—Livid Swimming Crab.—*Fabr. Milne Edwards, Hist. des. Crust.*, t. i, p. 442; *Bell's Brit. Stalk-Eyed Crust.*, p. 109; *Couch's Cornish Fauna*, p. 72.

Portunus lividus.—*Leach, Brit. Malac.*, pl ix, fig. 3-4.

Bell says l.c., p 110. "The occurrence of this crab is extremely rare on our coasts. Dr. Leach had only seen one prior

Edwards says that it is very common in the Mediterranean. Risso does not mention it, unless, as is not improbable, that his species of *P. Leachii* be identical with it.

*PORTUNUS PUSILLUS*.—Dwarf Crab.—*Leach, Malac. Brit. Crust., t. ix; Milne Edwards, Hist. des. Crust., t. 1, p. 444; Bell, Brit. Stalk-Eyed Crust., p. 112.*

*P. Maculatus*.—*Risso, Hist. Nat. En Merid., V, p. 5.*

Common. Bell says that this species inhabits deep water and is common on the Coasts of Devonshire and Cornwall. It is found from the Isle of Man to the Mediterranean sea, from which it has been recorded by Risso and Roux.

Its ordinary size is about four lines in length. But Mr. McAndrew took a male off the Isle of Man fully an inch in breadth and eight tenths of an inch in length.

#### *PINNOTHERIDÆ*.—(PARASITIC CRABS.)

GENUS, *PINNOTHERES*.—*Fabr, Leach, Edwards.*

Antennæ small, short, eyes impoverished, small, on short peduncles; carapace round, globular; chelæ, sub-equal, legs short. These crabs inhabit the shells of bivalve Mollusca.

*PINNOTHERES PISUM*.—Pea Crab.—*Pennant, pl. 1, fig. 1; Leach, Malac. Brit., t. 14; Milne Edwards, Hist. des Crust., t. 2, p. 30; Bell, Brit. Stalk Eyed Crust., p. 121.*

"This species seems rare with us and only found in the Mussel shell, the natural inhabitant of which it either finds diseased or renders so. I have never found it in the *Pinna* as reported by authors, though many have been examined for that purpose."

Mr. Ball informed Mr. Bell that he had, on two occasions, taken a great number of *Pinnotheres*, which were all males, from *Cardium edulis* (the common cockle), nine out of every ten contained a crab. On opening oysters at Tenby, in Wales, he has likewise procured this crab, and says that at every age it generally selects such shell as with out-stretched legs it would fill from side to side.

The young or zœa of this crab has been described and figured by Mr. Vaughan Thompson in the *Entomological Magazine*, vol. iii, p. 88, which has been copied into *Bell's British Stalk-Eyed Crustacea*, as a vignette to page 125.

PINNOTHERES VETERUM—Pinna Pea Crab.—*Bell*. Ancient Pea Crab.—*Couch*, *Bosc*, *Leach Malac. t. 15*; *Milne Edwards, Hist. des Crust., t. ii, p 32, pl 19*; *Bell, Brit. Stalk-Eyed Crust., p 72*.

"This is more rare than the last named, but there is a specimen in the Museum of the Athenæum, at Plymouth, as also of *P. Varius* of Leach, and either marked by that gentleman or Mr. Prideaux, but which is supposed by Dr. M. Edwards to be identical with *P. Pisum*, a species that is subject to variation at different stages of growth."

According to Bell it has been found in *Pinna ingens* both on our Coast and in the Mediterranean: it has also been taken in *Modiola* and in the common oyster.

Bell considers that *P. Montagui* of Leach is a variety only of this species.

#### GONOPLACIDÆ.—(ANGULAR CRABS.)

GENUS, GONOPLEX.—*Leach*.

"Foot-stalk of the eyes long, received into a cavity occupying the chief part of the anterior border of the carapace. Carapace angular and extended laterally."

GONOPLEX ANGULATA—Square Crab.—*Milne Edwards Hist. des Crust., t. ii, p. 61*; *Pennant pl. 5, fig. 10*; *Bell's Brit. Stalk-eyed Crust., p 130*.

*G. bispinora*.—*Brit. Malac., t. xviii*.

## GENUS, GELASIMUS.

"Foot-stalk of the eye long and slender, the transparent cornea small. Carapace resembling that of *Gonoplax*, but more advanced in front, and less extended laterally.

This family (by Genus) is by Dr. M. Edwards placed among the *Ocypodidae*, but is here coupled with *Gonoplax* from the great similarity of form and habit of the following species.

In the history of Crustaceans by Dr. M. Edwards, no notice is given of any species of this Genus as found in the European seas; and therefore I feel some hesitation in assigning to it a species frequently found in the stomach of fishes taken in depths varying from five to more than twenty fathoms, but of which no figure is found in the works of Pennant or Leach.

The form of the Carapace is represented by Dr. M. Edwards, pl. 18, fig. 10, and consequently much resembling that of *Gonoplax*; but that of the present species differs from the figure by that gentleman in possessing a second and well-marked hook on the lateral margin a little behind the anterior angle, and at the place where in the *Gonoplax bispinosa* there is a protuberance much less marked, but giving origin to the trivial name. Both claws are of equal size and less than the transverse breadth of the carapace. The eye-stalks are concealed in the manner of *Gonoplax*; but as the carapace is more advanced at the separation of the ocular cavities, when withdrawn, their extremities point a little backward.

I find but little difference in the form of the male and female, and none in the proportion of the claws, though such is the case for the most part in Crustaceans. I have provisionally designated it *G. Bellii* (Couch MS and fig.) in honour of the professor of Zoology in Kings' College, whose labours have been eminent in this department of science."

## GRAPSIDÆ.

GENUS, PLANES.—*Leach*.

„ *Nautilograpsus*.—*Edwards*.

„ *Pachysoma*.—*De Haan*.

Carapace quadrate, straight in front, rounded posteriorly. Orbits placed at the latero-anterior angles, space between the eyes half the width of the carapace. First pair of legs chelate robust,

not longer than the carapace; remaining pairs compressed, a little longer and more slender than the first.


Bell says that he has given this name to the genus because it was applied by Leach in MSS. in the British Museum, and adopted by Bowdich in his "Excursion in Madeira and Porto Santo."

PLANES LINNEANA,—*Leach MSS.*—Floating Crab.

This is a stray inhabitant of our shores, and drifted hither after Atlantic gales. Its proper habitat is the Sargossa or Gulf-weed of Mid-Atlantic. Sloane says that it was these crabs that Columbus, finding alive on the Sargossa floating in the sea, concluded himself not far from some land, in the first voyage he made, on the discovery of the West Indies.

In our report to the British Association on the marine Fauna and flora of S. Devon and Cornwall, Mr. Couch says, "In the spring of the present year, 1867, an example of the Hawk's-bill Turtle was taken in the channel, at not a great distance from the French coast, and therefore not to be classed as British; but when brought alive and active into Polperro there were found, adhering closely under the shelter of its tail, two full grown examples of this crab; the situation evidently chosen for support and shelter; for from the structure of their hind legs, it does not appear probable that they can maintain themselves at the surface without the aid of some extraneous support."

Mr. Couch says "a species of the Genus Grapsus is in the Athenæum at Plymouth,, under the name of *G. Pelagicus*, by Mr. Bridgman, and known to Dr. Leach, but not in any published



"Rare. Mr. Couch says that this is the only species that he has met with, and Dr. M. Edwards thinks that the others named are only varieties. The other two are in the Athenæum at Plymouth."

It has been taken at Scarborough, and is rare in Ireland.

**EBALIA CRANCHII**—Cranch's Ebalia.—*Leach, Malac.*, p. 25; *Milne Edwards Hist. des Crust.*, vol. ii, p. 129.

Bell says, "The male of this species so nearly resembles that of *E. bryerii* that without careful examination they may readily be mistaken for each other. The principal distinctive characters are to be found in the form and proportions of the antennæ, and the size of the granulations on the surface."

This is the most rare of the British species of *Ebalia*. It was discovered by the indefatigable and unfortunate Mr. Cranch in Plymouth Sound, where, according to Leach, it was afterwards observed in considerable numbers.

**EBALIA PENNANTII**—Pennant's Ebalia.—*Leach, Malac. Brit.*, pl. 25; *Milne Edwards, Hist. des Crust.*, vol. 2, p. 129; *Pennant*, pl. 9, fig. 19.

This species ranges from Shetland to the coast of Cornwall.

#### GENUS, ATELECYCLUS.—*Leach*.

"Carapace large, circular, arched anteriorly, more contracted behind. Cavities of the eyes longitudinal, front denticulated."

**ATELECYCLUS HETERODON**—Circular Crab.—*Leach, Malac. Brit.*, t ii; *Milne Edwards, Hist. des Crust.*, t 2, p. 143.

"Common in the stomachs of fishes, chiefly Cod fishes and common Rays, from the depth of 20 to 50 fathoms. They must abound at these depths, as I have found more than thirty in a single fish, and almost every Ray opened for several days in succession was found to contain them."

It has been recorded from the north of Scotland, and on the Irish coast.

#### GENUS, CORYSTES.

Carapace longer than broad, and in shape approaching an ellipse. Outer antennæ very long, and inserted in a cavity of the orbitary foramen.

**CORYSTES CASSIVELAUNUS**—Long Crab—*Couch*.—Masked Crab—*Bell, Leach, Malac. Brit.*, p. 1.

*Corystes Dentatus*.—*Milne Edwards, Hist. des Crust., vol. 2, p. 148*; *Couch, Cornish Fauna, p. 74*.

*Cancer Cassivilanus*—*Pennant, pl. 7. C. Personatus, of some writers*.

It is common on sandy shores at low water, "where it burrows in the sand, leaving the extremities of the antennæ alone projecting above the surface. These organs are of some use beyond their common office of feelers, perhaps as in some others, they assist in the process of excavation; and when soiled by labour, I have seen the Crab effect their cleaning by alternately bending the joints of these stalks, which stand conveniently angular for this purpose. Each of the long antennæ is thus drawn along the brush that fringes the internal face of the other, until both are cleared of every particle that adhered to them."

The animal received its synonym of Masked Crab from the representation of a human face impressed upon its carapace.

#### ANOMURA.—(SOFT-TAILED CRABS.)

The genera of this group are distinguished from the *Brachyura* by the length of the pleon or tail, many of which from occupying shells of molluscs and other situations have no hard or crustaceous covering, hence their name. But the whole group or sub-order are recognized by having the fifth and sometimes the fourth pair of legs feeble and small.

#### PAGURIDÆ.



in the empty shells of various species of the turbinated mollusca, moving about in this way from an early stage of their existence as if the structure were a portion of their own bodies.

They cannot, indeed, be easily induced to quit their habitation, but shrink into it on the least appearance of danger, so that the usual way in which they fall victims to an enemy is when the shell and its inhabitants are swallowed together. Few crustaceans are more frequently found in the stomachs of fishes, and as they quit the shell when about to die, they soon become the food of their devourer, the empty shell being speedily rejected from the mouth. These crustaceans also quit their assumed tabernacle from increase of size, which as in others, is at the time of exuviation; and on one occasion, when I was observing the combat of a pair in captivity, the smaller, which seemed to have felt itself fettered by its unwieldy covering, quitted the encumbrance, and manœuvred round the enemy with great alacrity in its naked condition. They often seize the fishermen's bait, and are drawn up from deep water by the line; and in feeding I have seen them hold their prey with the smaller (or left) hand, whilst the other was engaged in nipping off pieces and conveying them to the mouth. They breed when of small size, the pea being thrown round on the back, from which position it is certain that they must quit the shell in order to deposit it."

This last statement is corrected by the fact that Crustacea never deposit their spawn, but the young are hatched from the egg and are thrown out of the shell by the current of water that passes out of the shell during the process of respiration. I have seen them ejected through the branchial passage under the wing of the carapace.

Mr. W. A. Lloyd, who was formerly curator of the Hamburg aquarium, informed me that in the spring of the year in the aquarium he had seen the male of this crab take hold of the shell in which a female was contained, and carry her about for weeks together, grasping the thin edge of the shell, and when the female was fed the male did not take away the food as he would if a male one fed in his vicinity.

In the Zoologist for July 1871, pp. 26-85, Mr. Gurney states that he found in one of the capsules of a group of eggs of *Buccinum*, that had been discharged, a little whelk shell not larger than No. 5 shot, occupied by a young Hermit crab about an



eighth of an inch in length, and in another capsule a second hermit crab of similar size, but not ensconced in a shell.

This crab is very generally distributed on European coasts.

PAGURUS PRIDEAUXII (Prideaux's Hermit Crab).—*Leach, Malac., Brit. t. xxvi, pp. 5, 6; Milne Edwards, Hist. des Crust., t. ii p. 255; Bell, Hist. Brit. Stalk-Eyed Crust., p. 175.*

“More scarce than the last.

“I have examined a specimen with a line of hairs encompassing the thorax (pereion), with a few rather long fibres also pointing forwards from the first segment of the abdomen (pleon); but further observation is necessary to decide whether it be a distinct species.”

This species was first taken by Prideaux, in Plymouth Sound. Since then it has been found on many parts of the coast.

It is frequently found associated with a sea anemone on its shell, (*Adamsia maculata*.) It is not unfrequently associated also with a nereid annelid and an amphipodous crustacean. I have seen the annelid come out of the shell when the crab was feeding and steal his food from him.

PAGURUS CUANENSIS.—*Thompson; Bell, Stalk-Eyed Crust., p. 178.*

Dredged off the coast in Whitsand Bay, near Plymouth. C.S.B.

*Report of Dredging Committee British Association, 1868.* First found in Ireland by Thompson. *Report Brit. Assoc., 1843, p. 267.*

PAGURUS ULIDIANUS.—*Thompson, Rep. Brit. Assoc., 1843 p. 257; Bell, Stalk-Eyed Crust., p. 180.*

Off Plymouth. C.S.B. *Rep. Brit. Assoc.*

I have little doubt but that the suggestion of Professor Bell is correct, and that *P. ulidianus* is the young of some other

This species was first found in South Wales, several years ago, and no naturalist appears to have met with it since. In the summer of 1865 I again met with it in tolerable abundance. I took it with a dredge off the entrance to Plymouth Sound, and seeing it with a number of shrimps in the basket of a fish woman, at Teignmouth, I purchased the entire stock, and hastening to the beach, there, with the incoming tide I took many specimens, which I kept alive. This, the prettiest of all the pretty genus, has the habit of burrowing in the sand, and it is probably to this circumstance that it has not been met with more frequently.

An interesting point in the development of this animal I have been enabled to make out and publish in the Report on the Marine Fauna and Flora of South Devon and Cornwall, presented to the British Association for 1865. Early in June we were enabled to capture many specimens of the young animal in various degrees of progressive growth, a circumstance that has enabled us to declare that the genus *Glaucothoe* described by Mr. Milne Edwards in the *Annales Sci. Nat.*, for March, 1830, *Prophylax* of Latrielle, is none other than an immature stage of *Pagurus*; at this period the little creature swims freely in the ocean, and so continues until obliged by an increase of growth to take refuge in a shell, when he settles down and becomes a Hermit crab.

#### PORCELLANADÆ.

GENUS, PORCELLANA.—*Lamarch.*

"Carapace nearly circular; hands broad and twisted; the hinder pair of legs slight and weak, bent on the other, and ending with a finger. The abdomen (pleon) bent under as in *Brachyurus*, but ending in a fan-shaped tail."

PORCELLANA PLATYCHELES (Hairy Crab).—*Milne Edwards, Hist. des Crust.*, t. ii, p. 255; *Pennant*, p. 6, fig. 12; *Bell, Stalk-Eyed Crust.*, p. 190.

"Abundant under stones at low water mark. It is incapable of moving in any direction except backwards, not lifting its claws, but drawing them after it; the antennæ lying on the sides of the carapace in the direction of its march. Unlike our other crabs, it does not wait for an attack to throw off its legs; but siezing an enemy with its nippers, it leaves them to do all the injury of which they are capable, whilst itself has retreated to a place of safety."

Its geographical range is from the Orkneys, where it reaches; its largest size, to the Mediterranean. On our coast it ranges from the shore to about three fathoms of water, and is very common.

*PORCELLANA LONGICORNIS*.—*Pennant*, *pl.* 1, *fig.* 2.

*Pisidia longicornis*.—*Leach*, *Dict. des. sc. nat.*, *xviii*, *p.* 54 (*not Malac. Brit.*); *Milne Edwards*, *Hist des Crust.*, *Vol.* 2, *p.* 257; *Bell*, *Stalk-Eyed Crust.*, *p.* 193.

*Porcellana Leachii*.—*Gray*, *Zool. Miscel.*, *p.* 15; *Couch*, *Cornish Fauna*, *p.* 76.

Common on zoophytic and rocky ground, from one to forty fathoms of water. It seldom frequents the shore above half-tide.

I think that there can be little doubt but that Mr. Bell is correct in his opinion that *Porcellana acanthocheles* of Couch's previous Cornish Fauna is but a young specimen of this species.

### *GALATHIADÆ.*

GENUS, *GALATHEA*.—*Fabr.*

"Carapace covered with transverse sections edged with short hair; snout (rostrum) advanced and spirey; half of the abdomen (pleon) permanently bent under."

Carapace depressed; anterior pair of legs chelate, equal, flat, long; posterior pair feeble, unfit for walking; abdomen (pleon) broad, flat; posterior pair of pleopoda (tail) broad, flat; telson wide.

*GALATHEA STRIGOSA* (Plated Lobster); *Linn.*



*GALATHEA SQUAMOSA* (Scaly Galathea, Bell.)—*Leach, Malac, pl.* 28; *Milne Edwards, Hist. des Crust., t. ii, p. 975, Bell, Stalk-Eyed Crust, p. 197.*

Common under stones at low water.

This species is not so frequent as *G. strigosa*, and frequents deeper water, ranging, according to our experience, to 12 fathoms.

*GALATHEA NEXA*.—*Embleton, proc., Berwickshire Club; Bell, Stalk-Eyed Crust., p. 204.*

We have taken this specimen off the Cornish coast in forty fathoms of water. It has been taken at Zetland and in Ireland.

*GALATHEA DISPERSA*.—*Spence Bate; Proc. Linnean Society.*

This is a smaller species than the two preceding, and is among our commonest form beyond low water.

*GALATHEA ANDREWSII*.—*Kinahan, Dublin Nat. Hist. Soc.*

This species was first found off the coast of Cornwall, but described by Prof. Kinahan from a female taken in Dublin Bay. It has since been described by Mr. Spence Bate, from a male taken off the Cornish coast. The male differing from the female in having a much longer pair of chelate limbs.

This species is tolerably frequent on the zoophytic ground from 10 to 50 fathoms, and the female is apparently much more abundant than the male.

It is perhaps the smallest species of our local forms.

*GALATHEA BAMFFICA*.—*Pennant, Brit. Zool., iv, t. iii.*

*Munida rugosa*.—*Leach, Dict. des sc: Nat., xviii, p. 52.*

*Galathea bamfia*.—*Leach, Edin. Encyc., vii, p. 398.*

*Munida rondellii*.—*Bell, Stalk-Eyed Crust., p. 208.*

I have taken this species, which is rare on the stony ground, in from 20 to 30 fathoms off the Dudman.


Mr. Couch says that it is common in the stomachs of codfish. Bell in writing on the species says that it is far from common, and was found by Mr. Prideaux in Plymouth Sound, and he also received it from Falmouth, where it was taken by the late Dr. Cocks: and it is somewhat remarkable that it has not found a place in Mr. Couch's list of Cornish Crustacea. It is recorded from Zetland and Ireland, and it is worthy of note that while

extending as far as the Shetlands from whence I have received it, the specimens that have been dredged in the colder regions are very small, and the inhabitants of very deep water.

GALATHEA DIGIDISTANS.—*Spence Bate, Report on the South Devon and Cornwall Marine Fauna Flora; Brit. Assoc. Report, 1867, p. 277 and 279.*

In that report the author says, "among the Galathea that we have taken on our coast, and which embrace all that have been previously known as British, is one that we think must be accepted as not having been previously described. The largest specimen measuring from the extremity of the tail to that of the extended hands is little more than two inches, of which the animal itself, measuring from the extremity of the rostrum to that of the tail, is little more than one inch. This species differs from either of the others in having the large pair of chelate pereopoda (hands) flat and broad, the fingers much curved, very distant, and meeting only at their apex when closed, furnished on the inside with a considerable brush of hairs, and armed near the base of the moveable finger with a prominent tubercle or tooth, but which appears to be of little importance, since it is not able to impinge against the opposite finger.

We have sometimes thought that this specimen may only be an extreme form of the male of *Galathea squamifera*; but the armature of the surface of the hands, which is generally a safe guide to specific characters, has a distinct variation. In *G. squamifera* the arms are covered generally with a series of curved scale-like tuberculations, the anterior margin of which is divided



## MACRURA—(LONG-TAILED DIVISION).

## SCYLLARIDÆ.

GENUS, SCYLLARUS—*Fabr.*

Second pair of antennæ having a broad disc-like plate instead of an extended rod-like flageller.

SCYLLARUS ARCTUS.—*Linn.* ; *Milne Edwards, Hist. des Crust., t. ij, p. 262.*

Several specimens of this very interesting animal have been taken of late, one of which was at Polperro, and Mr. Couch had the honour of announcing its first addition to the British fauna. Since then it has been taken by Mr. Cornish at Penzance, and at Plymouth near the entrance of the Sound. Two of these were pregnant with spawn. Two also were taken in the stomach of a cod fish. Those that I have seen were about four inches long. The zœa of Scyllarus, according to Anton Dorn are Phyllosoma.

## PALINURIDÆ.

GENUS, PALINURUS.—*Fabr.*

"The body almost cylindrical, in front a deep impression, having on each side a prominent spine with others scattered about. The legs compressed, all monodactyle."

PALINURUS VULGARIS—(Crawfish, or Red Crab)—*Couch* ; *Leach* ; *Fabr* ; *Milne Edwards, Hist. des Crust., t. ii, p. 292* ; *Leach, Malac., pl. 30.*

Cancer Homarus.—*Pennant, pl. 11, fig. 22* ; *Bell, Stalk-Eyed Crust., p. 213.*

"A large and valuable species, inhabiting along the borders of rocks, where it is often taken in crab-pots, which, however, its long and unyielding antennæ frequently hinder it from entering. Keeping in companies, it also gets entangled in the trammel net, and in some abundance on the fishermen's lines. It meets a ready sale in the market, though not so highly esteemed for the table as the lobster."

It appears to be more general on our western coasts than elsewhere. They are rare in the north, both in England and Ireland.

The young or zœa of this species was first made known by Mr. R. Q. Couch, son of the author of the Cornish Fauna, at the meeting of the British Association at Dublin, 1857.


Its peculiar form, and the failure up to the present time, of tracing the animal through all its stages of development, makes it an object of interest; and I think it worthy of consideration, particularly by those who, as a crucial test in the theory of evolution, demand the exposition of a series of successional forms of life. They should remember that of this animal so common on our coast and in our markets, that there is no one yet who has been able to determine the several forms through which this animal passes in its growth from the zoea to the adult stage. Its first form is that known as *Phyllosoma*, its next stage is, I believe, that known as the genus *Amphion*, but this is only conjecture, as it has not been traced or clearly determined beyond the form the young quits the ovum. How, therefore, if a common form like this Crawfish cannot be traced from one end of its life to another, can we expect that the record of many forms of lost animals can be made perfect?

The young quit the ovum mostly at the same time, and Mr. A. Lloyd tells me that in the aquarium they suspend in the water for a day or so like a monster cone-like cloud, after which they disperse and die.

#### THALASINIDÆ.

GENUS, *CALLIANASSA*.—*Leach*.

“The integuments, except of the claw, less, soft; caudal plates large and foliaceous; first pair of legs didactyle, unequal; second pair small, didactyle;” third pair not didactyle. Carapace with rostrum.



**AXIUS STIRYNCHUS.**—*Leach, Malac. Brit. t. 33; Milne Edwards, Hist. des Crust., t. ii, p. 311; Bell, Stalk-Eyed Crust., p. 228.*

“The male of what I (Mr Couch) judge to be the same species, differs from the female in the snout (rostrum), which in my specimen of the latter was finely notched, and without the well marked longitudinal ridge of the former. The outer antennæ of the male are furnished with a ridge of fine hair on their inward line decreasing towards the point, which the female is without; and the former also has well-marked brushes near the lateral edges of the abdominal rings. This specimen, like those of the Genus *Callianassa*, has the habit of burrowing in the sand, from which it rarely emerges; and then it seeks shelter in a crevice covered with weeds, for it is sluggish in its motions, and if distant from a soft bottom in which to sink, incapable of escaping an enemy. A female that I obtained loaded with spawn, was dug out of sand in the middle of summer.

In the *Zoologist* for 1856, page 5282, Mr. Couch figured and described a specimen that appears to differ from this only in the more equal size of the two great chelæ, and this might have been due to a loss of one of the limbs and its gradual reconstruction.

**GENUS, GEBIA.**—*Leach.*

“Carapace terminating in a rostrum large enough to conceal the eyes, the sides forming a ridge passing back and encircling the region of the stomach. Outer antennæ without a scale. Abdomen (Pleon) long, more enlarged behind; caudal plates large. The claw legs straightened, the moveable finger large, but not met by a corresponding portion in opposition. The following legs one fingered, those of the second pair having the next to the last articulation large and ciliated.”

**GEBIA STELLATA.**—*Montagu; Leach, Malac., t. 31; Milne Edwards, Hist. des Crust., t. ii, p. 313; Bell, Stalk-Eyed Crust., p. 223.*

The habits of this animal is similar to that of *Callianassa*, in whose company it has been taken. Dr. Leach says that it has been taken in Plymouth Sound under the mud, in which it makes long winding horizontal passages, often a hundred feet or more in length.

**GEBIA DELTURA.**—*Leach, Malac., t. 31; Milne Edwards, Hist. des Crust., t. ii, p. 214; Bell, Stalk-Eyed Crust., p. 228.*



"I (Mr. Couch) find what appears to me to be this species in abundance in the Ray fishes (*Raia maculata* and *R. Clavata*), caught in from 30 to 50 fathoms of water."

*ASTACIDÆ.*

GENUS, HOMARUS.—*Edwards.*

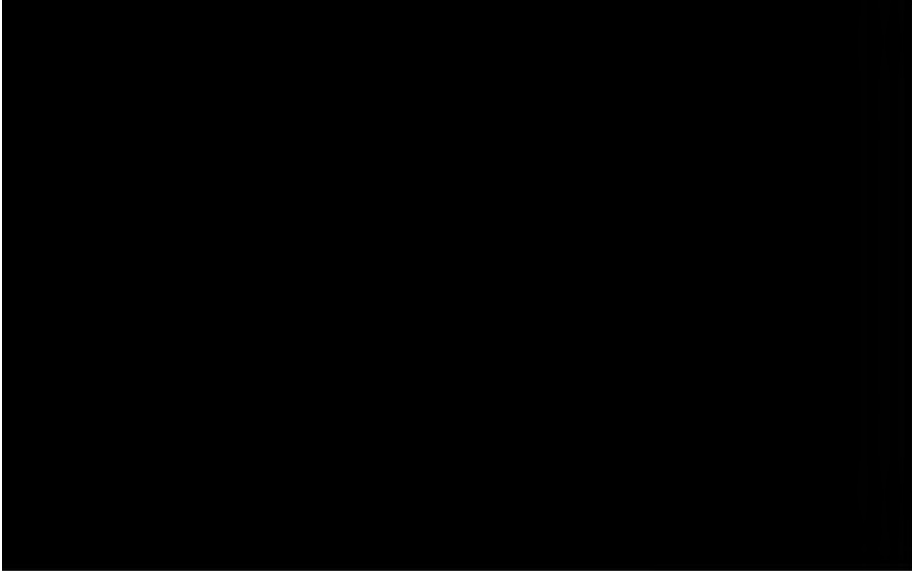
"Rostrum, and with a few spines on each side; scale of the outer antennæ very small, and like a tooth." First pair of limbs chelate, hands large, ovate compressed; second and third pair small, chelate; fourth and fifth simple.

HOMARUS MARINUS.—*Fabr.*

*Astacus marinus*.—*Pennant; Fabr.*

*Homarus vulgaris*.—*Milne Edwards, Hist. des Crust., t. ii, p. 334;*  
*Couch, Cornish Fauna, p. 78.*

"Lobsters are very common among the borders of not very elevated rocks, from close to the shore to the depth of about 20 fathoms. It is certain that they are less abundant at present than about the beginning of the present century; for whilst now, with a hundred pots, a dozen a day is regarded as tolerable success, persons now living have caught about a hundred in the same space, and in one instance a hundred and forty seven. One fisherman has taken 640 in a week, where now another has secured only 300 in a season. The reason assigned for this falling off is that the fishery for congers is not followed as formerly, and it is certain that this fish feeds eagerly on them. Perhaps, however, too little is ascribed to the increased demand in the market,



perfectly fresh, the lobster is attracted by that which is hung up to become tainted, or has been preserved by salting. Some other particulars of this fishery are given when speaking of the common crab."

Upon the authority of Mr. J. E. Saunders, the respectable fish salesman of Thames-street, Mr. Bell says, that often during the season the supply at Billingsgate is not less than 20,000 to 25,000 lobsters in one day. Most of these come from Norway, from whence the supply is not less than 600,000. It is computed, moreover, that not less than 150,000 reach London from Scotland and the neighbouring islands.

During the Commission which has recently been held in Devon and Cornwall, it is quite clear that the apparent scarcity is due to the increased number of fishermen, and the division of the produce of the fishery among so many.

Still, however, from increasing population, the demand is gradually becoming greater than the supply. It would therefore be desirable as much as possible to discourage the destruction of lobsters while bearing spawn. The loss of one lobster in berry is the destruction of some 60,000 to 100,000 young animals of the same kind.

In Bell's Crustacea I observe that he is indebted to Mr. Couch for the following paragraph—speaking of the opinion that the antennæ are thrown off at will or from injury,—I have not found this to be the fact; but subjecting the parts to blows or fracture, both in short and long-tailed crustacea, I have found the creature suffering acutely from the injury, most so when just emerged from the water; but in no case have they rejected the whole organ in consequence of the violence. If, however, it be violently handled, a separation takes place at the terminal joint of the peduncles in preference to any other place; and from this wound no stream of blood flows, but a fine membrane quickly forms on the surface, by which all effusion is prevented."

When the antennæ is reproduced it is curved in a spiral form within a saccular case, and becomes extended when the animal throws off its external covering in the next natural period of moulting.

On the same animal Mr. Bell gives the following statement on the authority of Mr. Peach :—

"I have heard the fishermen of Gorran Haven say that they have seen in the summer, *frequently*, the old lobsters with their young ones around them; some of the young have been noticed as six inches long. One man noticed the old lobster with her head peeping out from under a rock, the young ones playing around her; she appeared to rattle her claws on the approach of the fisherman, and herself and young took shelter under the rock; this rattling, no doubt, was to give the alarm. I have heard this from several, some very old men, who all speak to this without concert, and as a matter of course; and they are men I can readily believe."

GENUS, CRANGON.—*Fabr.*

"Carapace somewhat depressed, with only the rudiment of a rostrum; antennæ inserted on about the same transverse line, on the outer side a large scale. The claw legs expanded, the moveable finger opposed to a slight rudiment of a process." (Subchelate).

CRANGON VULGARIS—Sand Shrimp.—*Fabricius; Milne Edwards, Hist. des Crust., t. ii, p. 341; Leach, Malac, pl. xxxvii; Bell, Stalk-Eyed, 256; Astacus crangon, pl. 15, fig. 30.*

"Common in harbours on a sandy bottom, in which it buries itself, an operation performed by the aid of the hinder legs, but it heaps the loose sand on itself by the action of the antennæ."

CRANGON SPINOSUS.—*Leach; Bell, p. 261.*

Crangon cataphractus.—*Edwards, Hist. des Crust., t. ii, p. 243; Couch, Cornish Fauna, p. 79.*

*Pontoporellus spinosus*—*Leach, Malac. pl. xxxvii, a*



feel sure that the variations between the several forms are dependant upon habitat. Those of the Arctic and more northern forms having the spines more strongly developed.

Found occasionally on stony ground in about 20 fathoms of water.

CRANGON TRISPINOSUS.—Three-spined shrimp.—*Bell, Stalk-eyed Crust.*, p. 265.

*Pontophilus trispinosus*.—*Hailstone, Mag. Nat. Hist.* viii. p. 261, fig. 25.

I have taken four specimens of this species in Bigbury bay, on the north coast of Devon. Strictly this is not Cornish, but I can hardly imagine that an animal can be found as near, and yet not existing on the coast of Cornwall, the conditions being so similar.

#### GENUS, NIKA.—*Risso*.

First pair of antennæ two branched; first pair of legs dissimilar, one chelate, the other simple; second pair long multi articulate, minutely chelate.

NIKA EDULIS.—*Risso, Crust. de Nice*, p. 85; *Bell, Stalk-Eyed Crust.*, p. 275; *Edwards, Hist. des. Crust.*, t. ii, p. 364.

We have taken it occasionally on stony ground in about 30 fathoms of water.

NIKA COUCHII.—*Bell, Stalk-Eyed Crust.*, p. 278.

We have taken this in the same locality as the other.

With all due deference to the ability and a cute observation of the author of the work cited, I must insist that this is nothing more than a variety of *N. Edulis*. It was first found by Mr. Couch and sent to Professor Bell, who never saw but this one specimen.

#### GENUS, AUTONOMEA.

"Eyes on short footstalks, projecting from beneath the border of the carapace. The snout scarcely passing beyond the eyes. The inner antennæ double, one filament much longer than the other. Outer antennæ slender, and much longer than the body, first pair of hands only with fingers."

AUTONOMEA OLIVII.—*Milne Edwards, Hist. des. Crust.*, t. ii, p. 361.

"This species has been hitherto unknown as British, but I have examined several specimens taken from the stomachs of fishes, from the depth of 15 or 20 fathoms. Some of these were of

larger size than described from the Mediterranean. One, not the largest measuring three inches from snout to tail, with antennæ of the length of five inches."

This species has not been noticed in *Bell's Crustacea*.

### *ALPHEADÆ.*

GENUS, ALPHEUS.—*Edwards*.

Carapace covering the eyes. Second pair of antennæ having two branches. First pair of legs being large, chelate. Second pair long, slender, multarticulate, minutely chelate. Three posterior pairs simple.

From the manner in which the anterior margin of the carapace covers the eye, it is evident that all the members of this genus dwell under the surface of the sea bottom.

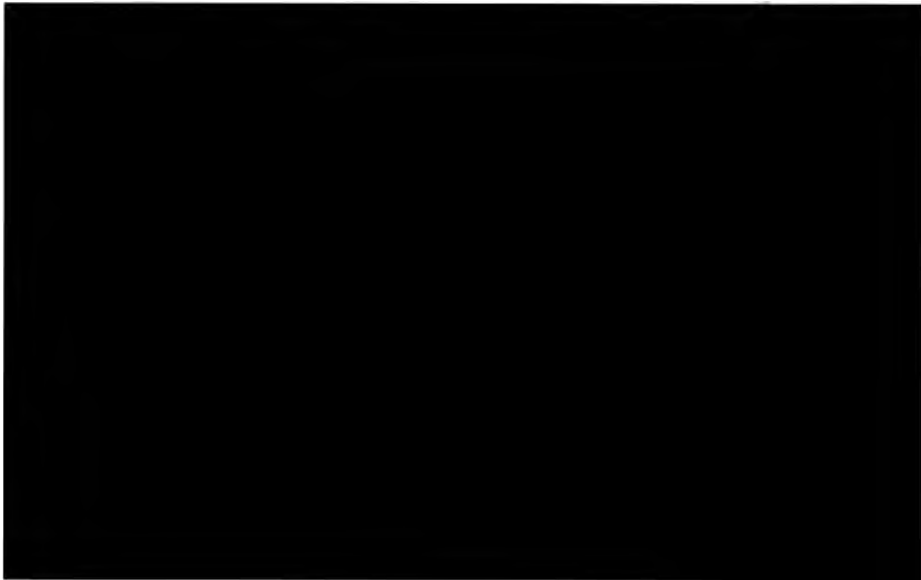
ALPHEUS RUBER.—*Edwards, Hist. des Crust., t. ii, p. 231; Bell, Stalk-eyed Crust., p. 271.*

The late Dr. Cocks, of Falmouth, took the first specimen of this species on our coast, as recorded by *Bell*. It has since been taken off the *Dodman* in thirty fathoms of water. Also in Plymouth sound. Its more general habitat is on stony ground in about thirty fathoms of water.

Its colour, salmon, and red at the joints.

ALPHEUS EDWARDSII.—We have taken several specimens of this species off the *Dodman* on stony ground, in about 30 fathoms of water.

I am inclined to believe that the habitat was shallower than recorded.



GENUS, HIPPOLYTE.—*Leach*.

“Carapace inflated on the top, rostrum large, compressed, toothed. First pair of antennæ with two branches. First pair of legs chelate, equal, short; second pair long, unequal, multarticulate minutely chelate.

HIPPOLYTE CRANCHII.—*Leach, Malac. t. xxxviii, fig. 13,—21; M. Edwards, Hist. des Crust., t. ii, p. 367; Bell, Stalk-eyed Crust., p. 288.*

“Common in crab boats, and consequently living where the fishing is carried on for lobsters.”

This species appears to exist all round the island, and is common on stony ground, in from 6 to 10 fathoms of water.

GENUS, CARADINA.—*Edwards*.

Like Hippolyte, but having the first pair of legs chelate, and more robust. The *propodos* or hand articulating with the *carpus* or wrist by the inferior angle only.

CARADINA VARIANS.—*Spence Bate, Brit. Assoc., Sept. 1865, p. 53.*

Hippolyte varians.—*Leach, Malac., p. 38; Edwards, Hist. des Crust., t. ii., p. 371; Bell, Stalk-eyed Crust., p. 286.*

This was long classed among the Hippolytes, but it undoubtedly belongs to this genus. Not uncommon in Plymouth sound. *Dr. Leach* says that it is abundant in pools amongst the rocks on the south-western coast of Devon and Cornwall, and it is curious that it is not mentioned in *Mr. Couch's Cornish Fauna* for 1857, as it is one of the most common species on the shore.

CARADINA TENUIROSTRA.—*Spence Bate, Rep. Brit. Assoc., 1867, p. 278; Ann. Nat. Hist. (Carcinological Gleanings) 1865,*

Several specimens taken in Plymouth sound in from 4 to 6 fathoms of water.

## GENUS, PANDALUS.

First pair of antennæ two branched. First pair of legs simple; second pair, slender, unequal in length, multarticulate, minutely chelate.

PANDALUS ANNULICORNUS.—*Leach, Malac. Brit. t. xi; Edwards, Hist., des Crust., t. ii, p. 384; Bell, Stalk-eyed Crust., p. 297.*

"Common in crab boats. There appears to be two other species on our coasts which I have been accustomed to call *Æsop's Shrimps*, from their habit of bending up the back into a hump, but further observation is necessary to decide whether they are known to naturalists."

One of these is the following.

PANDALUS THOMPSONI.—*Bell, Stalk-eyed Crust*, p. 290.

*Pandalus Jeffreysii*.—*Spence Bate, Ann. Nat. Hist., and Brit. Assoc. Rep.*, 1867, p. 278.


Occasionally on rocky ground in about 6 fathoms of water.

GENUS, PALÆMON.—*Fabr.*

"Carapace elongated into a serrated rostrum of considerable length." First pair of antennæ on three branches. First pair of legs small, slender, chelate; second pair larger and chelate.

PALÆMON SERRATUS.—Common Prawn.—*Pennant; Leach, Malac*, pl. 48; *Milne Edwards, Hist. des Crust*, t. ii, p. 389; *Bell, Stalk-eyed Crust.*, p. 302.

"A common species, found of largest size on the rockiest coasts, where it seeks the shelter of large stones and places overhung with weeds. It prefers the stillest waters, advancing and retiring with the tide; in summer preferring water that has a distinct feeling of warmth, and in winter going into what is, at that season, less cold than at the margin, but never far from land."



## GROUP STOMAPODA.

*MYSIDÆ.*GENUS, *MYSIS*.—*Lats.*

Legs terminating in a multarticulate extremity supporting a second multarticulate branch attached to the "coxa," or first joint. Female carrying the ova beneath the body in a pouch.

*MYSIS CHAMELEON*.—(Opossum Shrimp.)—*V. Thompson, Zool. Research, p. 27; Milne Edwards, Hist. des Crust., t. ii, p. 457.*

*M. Spinulosa*.—*Couch's Cornish Fauna, p. 80.*

"Common in summer, when it draws near the shallows from deep water. It also enters rivers in multitudes, forming a long line of migrations, at which season it is much devoured by the trout. Its English name is taken from its habit of carrying the eggs in a receptacle under the body, until they are hatched, as in the analogous genus of quadrupeds, the opossum tribe.

There are other species as well as the nearly allied genus *Cynthia* on our coast, but they are here omitted for want of a recent opportunity for comparison.

*MYSIS GRIFFITHSIÆ*.—*Bell, Stalk-eyed Crust, p. 342.*

We have taken this supposed species, but I feel assured that it is only the younger stage of a macrurous form, probably *Palæmon* or *Crangon*, the young of either genus of which it closely approximates.

GENUS, *THYSANAPODA*.

Branchia external and pendulous, branched, legs having the secondary branch short.

*THYSANAPODA COUCHII*.—*Bell, Stalk-eyed Crust, p. 346.*

This species was described by Professor Bell from specimens sent to him by "Mr. Couch, who obtained them from the Cornish coast from the stomach of a mackerel, which appeared to have been making a feast of this rare and interesting little crustacea." The author adds "The following account has been kindly furnished me by that gentleman, and shows that it can scarcely be considered as an ordinary inhabitant of our coasts. "The mackerel from which the curious shrimps *Thysanopoda* were taken, were caught almost at mid-channel, or almost ten leagues from us, perhaps seven or eight south of the Lizard; and I have not seen any since, although I am much in the habit of search-



ing the stomach of mackerel and other fishes. There were myriads in the stomachs of the mackerel at the time when I obtained those I sent you." As a mark of esteem Professor Bell "dedicated the species to that indefatigable and acute observer to whom we are indebted for so many valuable contributions to natural science."

We have since procured specimens near the coast, but only one or two.

### *SQUILLADÆ.*

#### GENUS, SQUILLA.

Carapace reduced in size, covering only half the Pereion (body), second pair or gnathopoda (outer maxilliped or footjaws, of authors), large sub-chelate. First three pair of legs (pereopoda) small, sub-chelate. Posterior three pairs only five joints, third joint carrying a second branch. Pleon large.

*SQUILLA MANTES*.—Rondel.—*Bell, Stalk-eyed Crust*, p. 351.

This species was taken first by Mr. Couch on the coast of Cornwall, and Professor Bell is indebted to him for a knowledge of it. It was found "about two leagues off, where the bottom is rocky with spots of sand."

*SQUILLA DESMARESTII*.—*Risso; Edwards; Bell, Stalk-eyed Crust*, p. 354.

Mr. Couch in his Cornish Fauna of 1868 records this species as rare, a few specimens having come into his possession, and he says that it seems to be the species alluded to by Pennant

and Turton, under the name of *S. mantes*.

*Alauna Rostrata*.—*Goodsir, Edin. New Phil.*, 1843.

This animal is probably to be met with in muddy bottoms all around our coast, and along the northern shores of Europe.

It was first taken in Cornwall, at St. Ives, by the late Mr. Barlee. From Falmouth I received it from Mr. Webster. I have taken it among trawl refuse off Plymouth.

GENUS, CUMA.—*Montagu*.

Carapace with the lateral angles produced in front of the confluent eye, but not produced into a rostrum like projection. Tail end with two double branched stylets. Telson absent.

CUMA SCORPIOIDES.—*Montagu, Linn. Trans. Vol. ix.*

Cuma Audouinii.—*Edwards, Ann. Nat. ; Goodsir ; Edin. New Phil.* ; 1843.

This animal has not yet been recorded as having been found on the coast of Cornwall, but as it was first found on the south coast of Devon, also in Scotland, I cannot but believe that it must exist on this coast.

This was taken by Montagu and is the first animal of the whole group that was found.

GENUS, EUDORA.—*Spence Bate*.

Differs from Cuma in having the antennæ obsolete.

EUDORA TRUNCATULA.—*Spence Bate, Ann. Nat. Hist., June, 1856.*  
Plymouth sound.

DIVISION II.

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THE SESSILE-EYED CRUSTACEA.

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## AMPHIPODA.

This name was given by Latreille to this order, on account of the animals comprised in it having two kinds of appendages, one for perambulation, the other for swimming.

*ORCHESTIDÆ.*

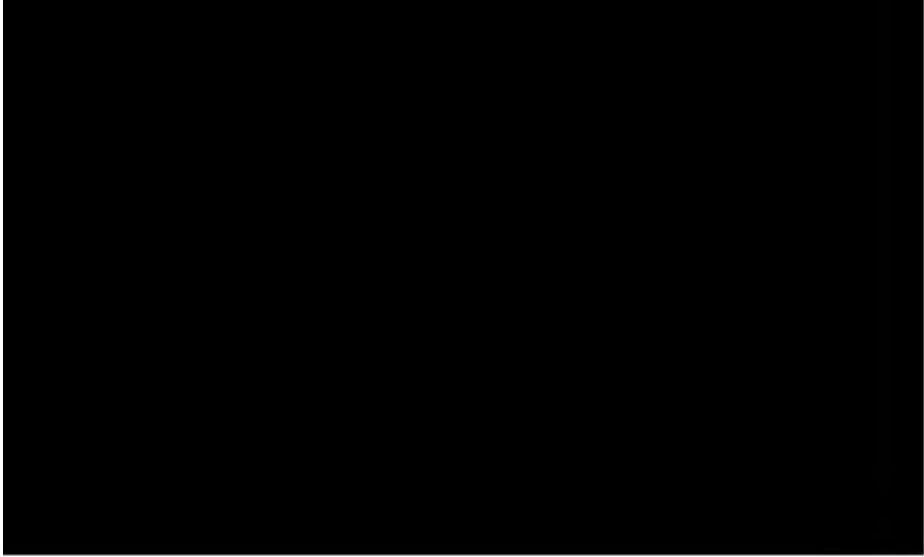
GENUS, TALITRUS.—*Latr.*

First pair of antennæ rudimentary, second long. First pair of legs strong and simple in both sexes, second pair small and feeble.

TALITRUS LOCUSTA—Sand Hopper.—*Linnaeus.*

Abundant on sandy shores above high-water mark, mostly under weed and offal. Dwelling in holes burrowed in the hot sand. In the summer they are abundant, in the winter they burrow into the sand.

GENUS, ORCHESTIA.—*Leach.*



assured that it only wants to be looked for on rocky coasts above high-water to be found.

ORCHESTIA DESHAYSII.—*Audouin, Explic. Savigny, Crust. Egypt, p. lxi., fig. 8.*

Rare. Few specimens have been taken in England, of these most have been found on the rocky parts of Plymouth Sound.

GENUS, ALLORCHESTES.—*Dana.*

Like *Orchestia*, but the first pair antennæ are longer than the peduncle of the second.

ALLORCHESTES NILLSONII.—*Rathke, Beit. zur Fauna, Norw, xx, p. 264.*

This animal may generally be found nearer the sea than *Orchestia*, and lives between high-water mark of ordinary tides and that of spring tides, in damp places, under weeds and stones.

ALLORCHESTES IMBRICATUS.—*Spence Bate.—Bate and Westwood Sessile-eyed Crust., vol. i, p. 43.*

GENUS, NICEA.—*Nicolet.*

Both pairs of antennæ short, subequal. First two pairs of legs subchelate. Telson, or extremity of the tail, deeply cleft.

NICEA LUBBOCKIANA.—*Spence Bate.—Bate and Westwood, Sessile-eyed Crust., vol. i, p. 74.*

I have received specimens of this species from Falmouth and Penzance.

#### GAMMARIDÆ. (STEGOCEPHALIDES.)

GENUS, MONTAGUA.—*Spence Bate.*

Antennæ subequal, first pair without a secondary appendage. First two pairs of feet subchelate.

MONTAGUA MONOCULOIDES.—*Montagu, Trans., Lin., vol. xi, pl. 11, fig. 3.*

I have received this from Falmouth, Penzance, and Plymouth.

MONTAGUA MARINA.—*Spence Bate.—Bate and Westwood, Sessile-eyed Crust., vol. 1, p. 58.*

I have found this species in the refuse of the trawlers, off the Eddystone. Mr. Edward, of Banff, has sent it to me from the

Moray Frith, and Mr. Gwyn Jeffreys has found it on the coast of Piedmont.

MONTAGUA POLLEXIANA.—*Spence Bate*.—*Bate and Westwood, Sessile-eyed Crust.*, vol. i, p. 64.

I have had this species dredged off the north coast of Cornwall, near St. Ive. I have also had it sent to me from the Shetland.

GENUS, DANAIA.—*Spence Bate*.

*Bate and Westwood, Sessile-eyed Crust.*, vol. i, p. 67.

Like *Montagua*, but first pair of legs less simple. Telson single.

DANAIA DUBIA.—*Spence Bate*.—*Bate and Westwood*, vol. i, p. 68.

Taken in trawl refuse off the Eddystone. Rare.

### LYSIANASSIDES.

GENUS, LYSIANASSA.—*Milne Edwards*.

First pair of antennæ short, thick at the base, appendiculate. First pair of legs simple, second subchelate, long, and slender. Telson single.

LYSIANASSA COSTÆ.—*Milne Edwards, Ann. des Sc. Nat.*, t. xx, p. 365.

Dredged off Plymouth.

LYSIANASSA AUDOUINIANA.—*Spence Bate*.—*Bate and Westwood*, p. 79.

I have taken this species the with dredge in Plymouth Sound.

Loughrin has found it at Polperro, and I have dredged it in Plymouth Sound.

*ANONYX MINUTUS*.—*Kroyer, Voy. en Scand. pl. xviii, fig. 2.*

Found in Plymouth Sound and Falmouth Harbour

GENUS, *CALLISOMA*.—*Costa.*

Like *Anonyx* and *Lysianassa*, but having the first pair of legs slender, and not tipped with a nail. Telson double.

*CALLISOMA CRENATA*.—*Spence Bate—Bate and Westwood, vol. i. p. 120.*

I have only seen two or three specimens of this species. I found it first off the Eddystone, and Mr. Edwards has sent to me from Banff. Mr. Jeffreys has taken it in abundance on the Haaf fishing ground, off the Shetland.

#### *AMPELISCIDES.*

GENUS, *AMPELISCA*.—*Kroyer.*

Eyes imperfect. Cephalon, or head, produced. Antennæ long and slender. First two pairs of legs slender, imperfectly subchelate. Telson squamiferous, cleft.

*AMPELISCA GAIMRADI*.—*Kroyer, Voy. en Scand. Crust., pl. xiii, fig. 1.*

Frequently taken in Plymouth Sound.

*AMPELISCA BELLIANA*.—*Spence Bate—Bate and Westwood, vol. i., p. 135.*

A northern species, but I have dredged it in Plymouth Sound.

#### *PHOXDES.*

GENUS, *PHOXUS*.—*Kroyer.*

Cephalon considerably advanced in front, like a hood, eyes none, or inconspicuous. First antennæ with a secondary appendage. First two pairs of legs subchelate. Telson double.

*PHOXUS SIMPLEX*.—*Spence Bate—Bate and Westwood, p. 140.*

Dredged in Plymouth Sound.

*PHOXUS HOLBOLLI*.—*Kroyer, Tidik., vol. iv., p. 150.*

I have taken it with the dredge in Plymouth Sound, and Mr. Edward has sent it to me from Banff. I am induced to believe that this and the previous species are but sexually distinct.

GENUS, GRAYA.—*Spence Bate*.

Approaches *Phoxus*, but with the eyes large and conspicuous.

GRAYA IMBRICATA.—*Spence Bate*.—*Bate and Westwood*, vol. i, p. 152.

Taken in Falmouth Harbour.

GENUS, WESTWOODILLA.—*Spence Bate*.

Head (Cephalon) produced in front, eyes confluent, antennæ subequal. First pair of legs subchelate, second not so.

WESTWOODILLA CÆCULA.—*Spence Bate*.—*Bate and Westwood*, vol. i., p. 155.

Taken in the trawl off the Eddystone. Mr. Edward has sent it to me from the Moray Frith.

WESTWOODILLA HYALINA.—*Spence Bate*, *Cat. Amps. Brit Mus.*, p. 103, *pl. vii*, *fig. 5*.—*Bate and Westwood's Sessile Eyed Crust*, p. 158.

This species was procured from trawl refuse which had been taken near the Eddystone Lighthouse.


These two species may be only male and female. In general form they are not very dissimilar, but there is a considerable variation in the microscopical structure of the dermal tissues.

The former species *W. cæcula* is undoubtedly a female, having been taken with ova. The latter we have not determined.

GENUS, ACANTHONOTUS.—*Owen*.

*App. to Ross., Scd. voyage N.W. Passage*, p. xc.

Cephalon anteriorly produced slightly, antennæ simple, sub-



GENUS, IPHIMEDIA.—*Rathke*.*Beit. zur Fauna. Norw.*

Cephalon produced anteriorly. Eyes two, antennæ simple. Hands feeble, imperfectly subchelate. Telson squamose emarginate.

IPHIMEDIA OBESA.—*Rathke*.—*L.c. nov act. Scop.*, vol. xx, p. 89, pl. iii, fig. 1; *Bate and Westwood, l.c.*, vol. i, p. 219.

Dredged near Drake's Island, in Plymouth Sound.

GENUS, SILGEBORGIA.—*Spence Bate*.*Cat. Brit. Mus.*, p. 118.

Cephalon but slightly produced. First pair of antennæ short, having a second appendage, hands large. Telson cleft.

SILGEBORGIA PALLIDA.—*Spence Bate, Bate and Westwood*, p. 203.

Plymouth Sound. I have no doubt but that it is the same species as *Gammarus brevicornis* of *Bruzelius* (Mem. on amphipoda of Skandinavia.)

GENUS, ISÆA.—*Milne Edwards*.*Hist. des Crust.*, t. iii, p. 26.

First pair of antennæ with secondary branch, hands subchelate, all the legs smaller but subchelate. Telson cylindrical, single.

ISÆA MONTAGUI.—*Milne Edwards, l.c.* p. 26, pl. xix, fig. 11.—*Bate and Westwood*, vol. i, p. 215.

I have frequently taken this species.

GENUS, UROTHÖE.—*Dana*.*U. S. Expl. Exp.*, p. 920.

Body scarcely compressed. Eyes apart. First pair of antennæ with secondary appendage. First two pair of feet subchelate. Telson double.

UROTHÖE ELEGANS.—*Spence Bate*.—*Bate and Westwood*, vol. i, p. 200.

This species is named from its having beautifully variegated colours when alive. It was taken from some trawl refuse from the neighbourhood of the Eddystone.

It bears a generally close resemblance to *U. irrostratus*, which Mr. Dana took in the Zooloo seas. Nor is this the only instance



in which I have observed a close affinity of our own crustacea with those of the antipodal seas.

SULCATOR ARENARIUS.—Sandfurrow maker.—*Spence Bate, Bate and Westwood, vol. 1, p. 189.*

I first found this species on the coast of South Wales, on sandy shores between the tide marks, but I found afterwards that undescribed specimens had been in the collection of the British Museum, which had been taken by Dr. Leach in the neighbourhood of Falmouth.

The late Mr. Albany Hancock has paid considerable attention to the furrows made by this creature, and described them in a paper "On the vermiform fossils in the mountain limestone districts of the North of England," published in the "Transactions of the Tyneside Nat. Field Club."


GENUS, SULCATOR.—*Spence Bate.*

*An. Nat. Hist., vol. xii, p. 504, and vol. xix, p. 140.—Bate and Westwood, p. 187.*

Cephalon anteriorly produced. First two pairs of legs feeble, imperfectly subchelate. Most of the points of the legs developed like scales.

DARWINIA.—*Spence Bate, Cat. Amps. Brit. Mus., p. 108.—Bate and Westwood, p. 182.*

Cephalon produced anteriorly. First two pairs of legs smaller than the succeeding, and subchelate. The portion of the animal that supports the swimming legs (pleon) lies generally closely



the throat of a codfish, or from the skin of a common dogfish (*Squalus acanthus*.) The swimmerets of these specimens were thickly covered with a species of *Vorticella*, a circumstance that is suggestive that they lived rather in the retired and quiet position of the throat of the codfish, which their black colour also supports, rather than on the external surface of a fast-swimming dogfish.

GENUS, MONOCULODES STIMPSON.

*Marine invert. Grand Manan, p. 54.*

Cephalon produced and depressed anteriorly. Eyes coalesced into one. First antennæ without a secondary appendage. First two pairs of feet subchelate, wrist antero-distally produced to the extremity of the inferior margin of the hand. Telson entire.

MONOCULODES STIMPSONI.—*Spence Bate, Cat. Brit. Mus., p. 105, pl. xvi, f. 3*—*Bate and Westwood, p. 168.*

Our first specimen was taken in the Channel off the coast of Cornwall, but it only consisting of a mutilated portion, the original description in the catalogue of the British Museum was taken. We have since seen a specimen taken by the Rev. Mr. Norman off the coast of Northumberland.

GAMARIDES.

GENUS, DEXAMINE.—*Leach.*

*Edin. Encyclopedia, vii, p. 433.*

First pair of antennæ having the third joint of the peduncle reduced to resemble the first articulus of the flagellum. Without a secondary appendage. Mandibles having no appendage, Hands feeble, subchelate. Telson single, divided.

DEXAMINE SPINOSA.—*Montagu, Lin. Trans., vol. xi, t. ii, fig. 1.*  
*Bate and Westwood, vol. i, p. 237.*

All round our coasts where naturalists have searched.

It is a prettily coloured species, brilliant red with dark crimson spots. Those that are found nearer the shore are less bright but darker hue, and obtain a stain of blue that lessens their brilliancy.

GENUS, ATYLUS.—*Leach.**Zool. Misc., ii, pl. lxix.*

Like *Dexamine*, but having the mandibles furnished with a palpiform appendage.

ATYLUS SWAMMERDAMII.—*Milne Edwards, Hist. des Crust., t. iii. Bate and Westwood's Sessile Eyed Crust, vol. i, p. 246.*

We have taken it in Plymouth Sound, and Mr. Loughrin has sent it to us from Polperro.

ATYLUS BISPISSOSUS.—*Spence Bate, Cat. Amph. Brit. Mus., p. 104, pl. xxvii, fig. i.—Bate and Westwood, p. 250.*

We have dredged this species on the sandy bottom in Whitsand Bay, not far from the Rame Head, and have had it sent to us from Falmouth, as well as from Scotland and the coast of Northumberland.

GENUS, PHERUSA.—*Leach.**Edin. Ency., vii, p. 432.*

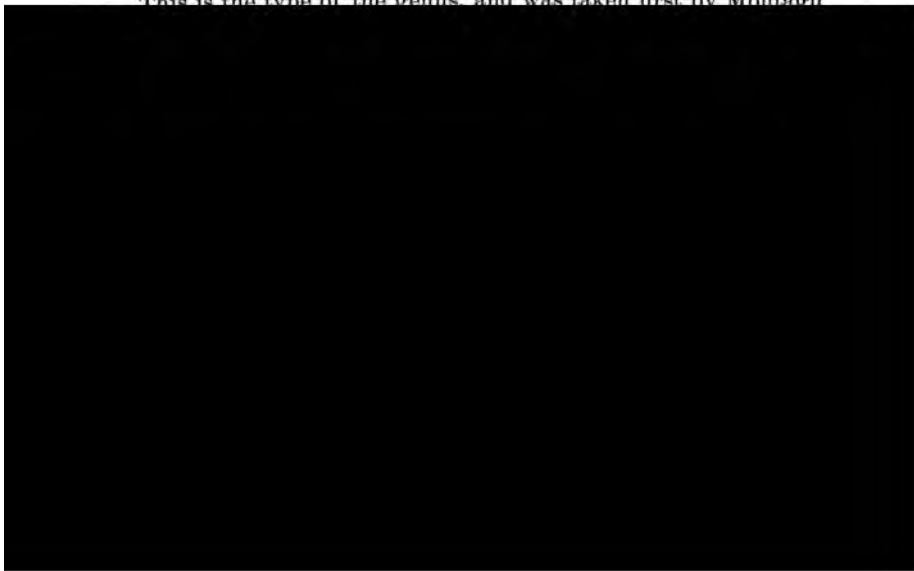
Like *Atylus*, but Telson not divided.

PHERUSA BICUSPIS.—*Kroyer, Grön Amph., p. 45, pl. i, fig. 1. Bate and Westwood, p. 253.*

We have had specimens taken at Falmouth, and Mr. Edward has sent it to us from Banff.

PHERUSA FUCICOLA.—*Leach, Edin. Ency. vii.—Bate and Westwood, p. 255.*

This is the type of the genus and was taken first by Montagu



We have dredged it in Cawsand Bay, and Mr. Loughrin has sent it to us from Polperro.

GENUS, AORA.—*Kroyer*.

*Zidst. zur 2, 1, p. 335.*

First hand larger than the second, and formed by third joint having the infero-anterior angle produced to meet the extremity of the finger.

AORA GRACILIS.—*Spence Bate, Cat. Amph. Brit. Mus., p. 160, pl. xxix, fig. 7.*—*Bate and Westwood, l.c., p. 281.*

We took our first specimen on the coast of Glamorgan; we have since obtained it from St. Ives and off the Eddystone.

It is remarkable that the only other species of this genus known is that described by Kroyer and Nicolet, and closely resembling this in form, it is from the coast of Chili.

GENUS, MICRODEUTOPUS.—*Costa*.

First pair of antennæ larger than the second. First hand larger than the second.

MICRODEUTOPUS WEBSTERII.—*Spence Bate, Cat. Amph. Brit. Mus., p. 162, pl. xxx, fig. 2.*—*Bate and Westwood, p. 291.*

Mr. Webster dredged this species in Falmouth harbour.

MICRODEUTOPUS VERSICULATUS.—*Spence Bate, Cat. Amph. Brit. Mus., p. 165, pl. xx, fig. 5.*—*Bate and Westwood, p. 295.*

We have dredged this species in Plymouth Sound.

GENUS, GAMMARELLA.—*Spence Bate*.

*Cat. Amph. Brit. Mus., p. 179.*

First pair of antennæ with second appendage. First hand small, second large. Last appendage of the tail single, brown. Telson, single, cleft.

GAMMARELLA BREVICAUDATA.—*Milne Edwards, Hist. des Crust., t. iii, p. 53.*—*Bate and Westwood, p. 331.*

The first specimen of this species was taken by Milne Edwards at Morbihan, on the coast of France. Our specimen was taken by Mr. Loughrin, at Polperro.

GENUS, MELITA.—*Leach*.

*Edin. Ency., iii, p. 403.*

First antennæ longer than second, appendiculate. Second hand longer than the first.

**MELITA PALMATA.**—*Montagu, Lin. Trans., vii, p. 69, pt. 6, fig. 4.*  
*Bate and Westwood, p. 337.*

It has been taken by Dr. Leach at Plymouth. Mr. Loughrin has found it at Polperro. It is a species that is by no means plentiful even where it has been found.

**MELITA OBTUSATA.**—*Montagu, Lin. Trans., vol. xi, p. 5, fig. 7.*  
*—Bate and Westwood, p. 341.*

The original type of this species is in the British Museum, it having been taken by Col. Montagu, at Salcomb, on the south coast of Devon, from which the figure given in the *Sessile Eyed Crustacea* was taken, while the description was written from a recent specimen taken in Plymouth Sound.

**MELITA PROXIMA.**—*Spence Bate, Cat. Mus. Amph., p. 184, pt. xxxiii, fig. 4.*—*Bate and Westwood, p. 344.*

This species has been taken in Plymouth Sound, and Mr. Edwards, of Banff, has sent it to us from that locality.

**MELITA GLADIOSA.**—*Spence Bate, Cat. B. M., p. 185, pt. 33, f. 6.*—*Bate and Westwood, p. 346.*

Taken in Plymouth Sound. It resembles *Gammanes podayer* of Mr. Milne Edwards, which undoubtedly belongs to this genus.

#### GENUS, *MÆRA*.—*Leach.*

First pair of antennæ longer than the second, having a second appendage. Second hand larger than the first. Telson double.

**MÆRA GROSSIMANA.**—*Montagu, Lin. Trans., xi, p. 359.*

When alive the animal is very transparent, its colour being



**EURYSTHEUS ERYTHROPHTHATMUS.**—*Lilgeborgy, in ofvers af Kongl. Vet. Akad. Zorhandl, 1855, p. 124.*

Not uncommon in Plymouth Sound, and it has been sent to us, among other places, from Banff, by Mr. Edward.

**GENUS, AMATHILLA.**—*Bate and Westwood, p. 459.*

Head produced to a sharp point. Antennæ rather short. First pair with a second branch. Hands small, subequal. Back carinated. Telson entire, slightly emarginate at apex.

**AMATHILLA SABINI.**—*Leach, Rosse's First Voyage, oct. ed., ii, p. 178.*

This is an arctic species. First taken in Baffin's Bay by Genl. Sabine, during Rosse's first expedition. It has since been found on all the northern places where naturalists have dredged, both on the European and American coasts. Those from the Arctic seas and the coast of Scotland are large, being about an inch in length, but the size appears to diminish in regular proportions as it progresses southward. In Shetland and the Moray Frith it is scarcely as large as the Arctic specimens. At the Menai Straits it is scarcely half as large, and on the south coast of Cornwall it appears to have reached its minimum size, as it has not been recorded further south. It will be found in rocky pools near low water mark occasionally everywhere.

**GENUS, GAMMARUS.**—*Fabricius.*

Three posterior rings of the body furnished with bundles of short spines. Eyes long, narrow, or curved. Antennæ slender, with a short second branch. Hands not large, subequal. Telson double.

**GAMMARUS MARINUS.**—*Leach, Lin. Trans, xi, p.*—*Bate and Westwood, p. 370.*

The colour of the animal is olive-green. They are very gregarious, and live amongst the seaweed on our shores, and frequent estuaries a considerable distance from the mouth of every river.

**GAMMARUS CAMPYLOPS.**—*Leach, Edin. Ency.*—*Bate and Westwood, p. 375.*

This species is named from the crooked shape of the eyes. It appears to be an intermediate form between *G. marinus*, and *locusta*. It is not very common, but it has been taken among other places in Plymouth Sound.

GAMMARUS LOCUSTA.—*Linnaeus, Fauna Suec., 2nd ed., p. 497.—*  
*Bate and Westwood, p. 378.*

This species appears to be pretty generally distributed all round Europe, and may be found in pools near low water. It inhabits the sea a little further from the shore than *G. marinus*. The parent in this species has been observed by Dr. Salter to watch over and care for its newly hatched young. These swim round and follow the parent, and when frightened will rush to her and hide themselves in the incubating pouch, in which they nestled until the danger was passed.

GAMMARUS PULEX.—*Linnaeus, Syst. Nat., 1055.—Bate and Westwood, p. 388.*

Common in all our ponds and fresh water rivers, but according to our own experience less frequent and smaller than in other parts of England.

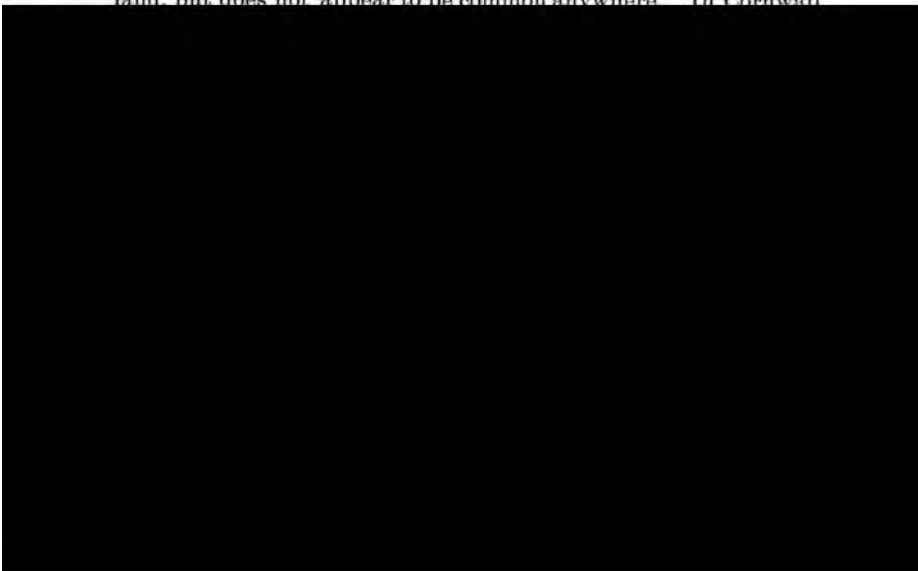
GENUS, MEGAMERA.—*Spence Bate.*

MEGAMERA SEMISERATA.—*Spence Bate.—Bate and Westwood, p. 401.*

This species as yet has only been recorded from Plymouth Sound.

MEGAMERA LONGIMANA.—(Long handed screw.)—*Leach, MSS.—*  
*Bate and Westwood, p. 403.*

This has been found in many places in Great Britain and Ireland, but does not appear to be common anywhere. In Cornwall



## DOMICOLA.

*COROPHIIDÆ*.—(PODOCERIDES.)GENUS, AMPHITOE.—*Leach*.

Antennæ subequally long, first without a second branch. Hand subequal. Last appendage of the tail having two branches, one with short spines or hooks, the other without. Telson single.

*AMPHITOE RUBRICATA*.—*Montagu, Lin. Trans., ix, p. 99.*—*Bate and Westwood, p. 418.*

The adult is colored a brilliant crimson with large blotches of white. When young the animal is a yellowish green with minute red spots and a few white blotches.

The animals of this subdivision live in homes of their own construction. This species makes one by collecting stray material round some chosen nook, which it binds together with an exquisitely delicate web. We have not been able to discover how this web is secreted, whether by the mouth or some special organ.

It is tolerably common in a few fathoms of water or on shores, but the first we ever saw were dredged in Plymouth Sound; of more brilliant a colour than any paint we could prepare to represent it.

*AMPHITOE VITTORINA*.—*Spence Bate, Cat. Amph. B. M.*—*Bate and Westwood, p. 422.*

Common on stony beaches associated with *Gammarus*, being larger, it may readily be detected as a "Triton amongst the minnows."

GENUS, SUNAMPHITOE.—*Spence Bate*.

*Cat. Amph. B. M.*—*Bate and Westwood, p. 429.*

Like *Amphitoe*, except that the Telson or extremity of tail ends in a hook.

*SUNAMPHITOE HAMULUS*.—*Spence Bate, Cat. Amph. B. M.*—*Bate and Westwood, p. 430.*

A specimen of this species has been sent to us from Penzance.

*SUNAMPHITOE CONFORMATA*.—*Spence Bate, Cat. Amph. B. M.*—*Bate and Westwood, p. 432.*



One specimen has been taken by us in Plymouth Sound, another was sent to us from the Shetlands.

GENUS, *PODOCERUS*.—*Leach*.

*Linn. Trans, xi, p. 360.*

First antennæ with minute second appendage; second antennæ not multarticulate, laminating in short strong spines or hooks. Hands unequal, second pair largest. Telson single, scalelike.

*PODOCERUS PULCHELLUS*.—*Leach, Edin. Ency., vii, p. 433.*—*Bate and Westwood, l.c., p. 436.*

We have taken it in Plymouth Sound, and Mr. Edward has sent it to us from Banff. It closely resembles *P. validus*, Dana, of South America.

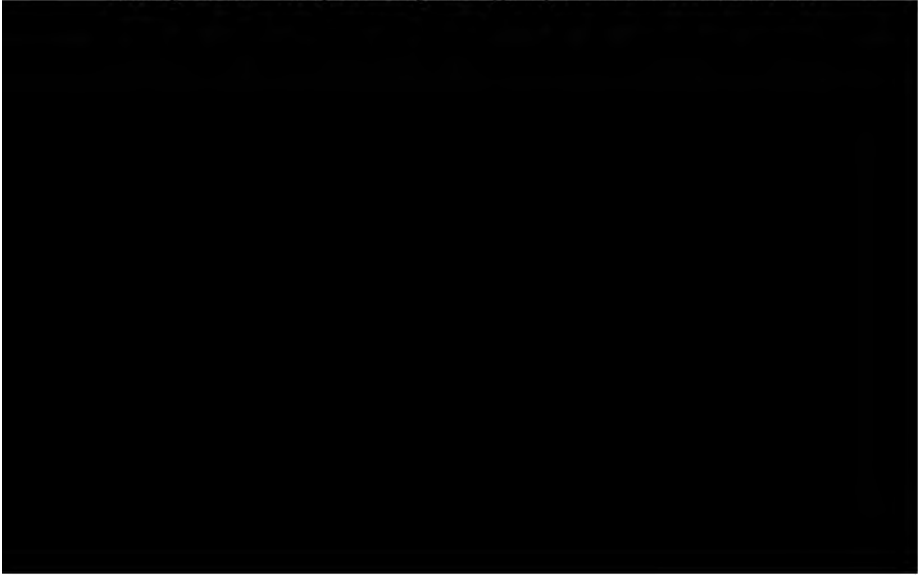
*PODOCERUS VARIEGATUS*.—*Leach, Edin. Ency., vii, p. 433.*—*Bate and Westwood, p. 439.*

This species is very common amongst the weed attached to buoys and floating objects, amongst which, and the sertularia, they build and occupy nests.

We have had specimens from Mr. Edward, of Banff, and Mr. Loughrin, of Polperro.

*PODOCERUS CAPILLATUS*.—*Rathke, Nov. Acta. Acad. Scop., xx, pl. iv, fig. 8.*—*Bate and Westwood, p. 442.*

This species also builds very pretty nests among the branches of various kinds of zoophytes. In one of these we found a mother with the young of different ages, demonstrating tolerably clearly in this comparatively low group of animals the instinct



complexly\* chelate; posterior of tail appendages unbranched. Telson rudimentary.

The animals of this genus construct tubes in which they dwell.

CERAPUS ABDITUS.—*Templeton, Trans. Ent. Soc.*, 1, p. 188, *pl. xx*, *fig. 3*.—*Bate and Westwood, l.c.*, p. 456.

Templeton took the specimens, from which he described the species between the southern and northern hemispheres. Dana has described a crustacean from the coast of Brazil under the name of *Pyctilus brasiliensis*, which nearly resembles this British species, which offers among other facts, evidence of the approximation of forms between British and South American crustacea.

It has been taken in Plymouth Sound. According to Mr. Templeton, it lives in a long narrow membranous tube.

CERAPUS, *Fem.*—GENUS, DERCOTHÖE.—*Dana, U.S. Expl. Exp.*, p. 968.—*Bate and Westwood, p. 459*.

These are females of the last genus, but differ so considerably in form, that they were described as a separate genus by Dana, and the name is retained in Bate and Westwood's "Sessile-Eyed Crustacea" as a temporary convenience for the females until the males have been determined. But we have little doubt but that *Dercothœ punctatus* is the female of *Cerapus additus*.

The second hand is smaller, and the carpus only projects as a scale below the hand.

GENUS, NÆNIA.—*Spence Bate*.

*Cat. Amph. B. M.*, p. 271.—*Bate and Westwood, p. 471*.

Antennæ subequal; no second branch. Hands subchelate, posterior pair of caudal appendages two branched. Telson cylindrical.

NÆNIA TUBERCULOSA.—*Spence Bate, Cat. Amph. B. M.*, p. 271, *pl. xlvii, fig. 2*.—*Bate and Westwood, p. 472*.

We have taken this species not unfrequently in the dredge off Plymouth, and we have received it from Banff, from Mr. Edward.

A closely allied species of this genus is known to inhabit a whelk shell, together with a soldier crab and annelid, in the peaceful character of a "Happy family."

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\* Complexly chelate means, when the claw is formed by more than two joints.

*COROPHIIDES.*GENUS, CYRTOPHIUM.—*Dana.**U. S. Expl. Exp.*, p. 839.

Head subquadrate. Body broad, narrowing posteriorly. Eyes prominent. Antennæ subpediform. Hands subchelate. Second much larger than first. Last pair of tail appendages rudimentary. Telson squamiferous.

We consider that Dana's genus of *Platophium* is identical with this.

This species has been taken with the dredge off Falmouth, and obtained on the shore of St. Michael's Mount


GENUS, COROPHIUM.—*Latrielle.**Gen. Crust.*, i, p. 58—*Bate and Westwood*, p. 492.

Body not compressed. Eyes small. First antennæ multarticulate. Second subpediform. First hand subchelate, second simple.

COROPHIUM LONGICORNE.—*Latr.*, *Gen. Crust. et Ent.*, 1, p. 89.—*Bate and Westwood*, p. 493.

This species may probably be found all round the British coast. Quatrefages, in his "Rambles of a Naturalist," says that "they come from the open sea in April, in myriads, to wage war with the annelids, which they entirely destroy before the end of May. They then attack the mollusca and fish, all through the summer, and disappear in a single night about the end of October."

Mr. Walker, of Chester, tried several experiments with this



CHELURA TEREBRANS.—*Philippi, vol. v, p. 120, pl. iii, fig. 5.*—*Bate and Westwood, p. 503.*

This is one of our most destructive wood-eating crustacea. It is commonly associated with *Limnoria legurium*, but fortunately for our piles and pier woodwork, it is not prolific as the smaller *Limnoria*. It has been found to destroy a piece of sound timber thirteen inches square in less than ten years. It eats into the timber in a level with the mud to the usual height of neap tides, avoiding, however, the knots in the wood. In this manner the wood is riddled in every direction, and is then easily destroyed by the force of the waves.

## HYPERINA.

### HYPERIDÆ.

GENUS, LESTRIGONUS.—*Milne Edwards.*

*Hist. des Crust., t. iii, p. 81.*—*Bate and Westwood's Brit. Sessile-Eyed Crustacea, vol. i, p. 3.*

Head orbicular, deeper than broad. Anterior division of the body (pereion) broader than the posterior (pleon). Eyes large. Telson single, triangular.

These are supposed to be the males of the following

GENUS, HYPERIA.—*Latrielle.*

*Bate and Westwood, vol. 2, p. 11.*

HYPERIA GALBA.—*Montagu, Lin. Trans., xi, p. 4, pl. 2, fig. 2.*  
Taken in the sea floating in medusæ, off the coast.

### CAPELLIDÆ.

GENUS, PROTO.—*Leach.*

*Lin. Trans., xi, p. 362.*—*Bate and Westwood, p. 36.*

Head and first somite of the body united. Posterior portion of the body rudimentary.

PROTO PEDATA.—*Abildgaard, in Müller, Zool. Dan., pl. iii, p. 33 pl. cl, fig. 1, 2.*—*Bate and Westwood, p. 38.*

Occasionally found in dredging all round the coast. The late Mr. R. Q. Couch took it at Mousehole, Cornwall.

GENUS, PROTELLA.—*Dana*.*U.S. Expl. Exp.*, p. 812.

Like Proto, but having rudimentary appendages to the two somites succeeding the hands.

PROTELLA PHASMA.—*Montagu, Trans. Lin. Soc.*, vol. ii, p. 66, pl vi, fig. 3.—*Bate and Westwood*, p. 45.

This species was first found by Col. Montagu, and we have obtained it in the neighbourhood of Plymouth; and Mr. R. Q. Couch has found it among confervæ, at Lariggan rocks, Mount's Bay, Cornwall.

GENUS, CAPRELLA.—*Linnaeus*.

Like Protella, but without any appendage to the two central segments of the body.

CAPRELLA LINEARIS (Skeleton Shrimp).—*Linnaeus' Syst. Nat.*, ii, p. 1056.—*Bate and Westwood*, p. 52.

All round our shores, amongst stones and weed. This animal appears to watch and protect its young, they creeping about the parent and looking like small branches of weed attached to her body.

CAPRELLA LOBATA.—*Müller, Zool. Dan., Prod.*, 197.—*Bate and Westwood*, p. 57.

We have taken this species in Plymouth Sound, and Mr. Edward has sent it to us from the Moray Frith.

CAPRELLA ACUTIFRONS.—*Latrielle's N. Dict. de. Hist. Nat.*, 2nd ed.,

*CAPRELLA ACANTHIFERA* (Skull-headed Skeleton Shrimp).—*Leach, Edin. Ency.*, vii, p. 404.—*Bate and Westwood*, p. 65.

It has been taken at Plymouth, on Drake's Island, at low water; as well as dredged in the Sound. Mr. Edward has sent it to us from Banff.

*CAPRELLA TUBERCULATA*.—*Guerin, Scon. Ran. Crust.*, pl. xxviii, fig. 1.—*Bate and Westwood*, p. 68.

Mr. Couch found a considerable number in the crevices of a crab-pot buoy, thrown on the coast at Polperro during a heavy gale; and Mr. R. Q. Couch obtained a female in Gwavas Lake, off St. Michael's Mount.

*CAPRELLA EGUILIBRA*.—*Say, Journ. Acad. Phil.*, 1, p. 391.—*Bate and Westwood*, p. 71.

Taken in Plymouth Sound on buoys hid among weeds.

Specimens apparently identical with this species have been sent to us from the North of England, from Rio Janeiro, from Hong Kong, and North America.

## ISOPODA ABERANTIA.

### TANAIDÆ.

GENUS, *TANAIS*.—*Audouin and Milne Edwards*.

Head and first segment united. Body elongated. Antennæ short. First hand large, didactyle; second pair slender.

*TANAIS VITTATUS*.—*Rathke, Nor. Act.*, 20, pl. i.—*Bate and Westwood*, p. 125.

Found at Polperro by Mr. Loughrin.

*TANAIS DULONGII*.—*Audouin, Expl. pl. Egypt.*, t. xi, fig. 1.—*Bate and Westwood*, p. 129.

This species was first taken on the coast of Egypt. We found it in tolerable numbers in the worm-eaten timber during the erection of the battery inside the breakwater, Plymouth; and at Polperro, where it was found by Mr. Loughrin.

GENUS, *APSEUDES*.—*Leach*.

*Edin. Ency.*, vol. vii, p. 404.

Body elongated. Head having first segment united. First antennæ longer than the second. Second antennæ with a foli-

aceous appendage. Last pair of caudal appendages two-branched.

APSEUDES TALPA.—*Montagu, Lin. Trans., ix, p. 98, t. 6, f. 6.*—

*Bate and Westwood's Sessile-Eyed Crustacea, vol. ii, p. 149.*

The first specimen of this very interesting animal was found by Col. Montagu on a large scallop shell (*Pecten maximus*), at Salcombe, on the south coast of Devon. It has been found in the Channel Isles, and in Plymouth Sound.

#### ANTHURIDÆ.

GENUS, ANTHURA.—*Leach.*

*Bate and Westwood, p. 157.*

Body slender, elongated. Head and segments quite distinct. First pair of legs robust and imperfectly subchelate, all the rest filiform. Tail appendages arranged to be dorsally concave.

ANTHURA GRACILIS.—*Montagu, p. 104.*—*Bate and Westwood, p. 162.*

First taken by Col. Montagu, many years ago, at his usual hunting ground, Salcombe harbour. It has since been taken at Falmouth, and off the south coast.

#### ANCEIDÆ.

GENUS, ANCEUS.—*Risso.*

*Crust. des Nice, p. 51.*—*Bate and Westwood, p. 170.*

Male. Head square. Mandibles developed anteriorly like antennæ, body having two segments wanting, the anterior division (pereion) much broader than the posterior (pleon). Only five pairs of walking legs, no hands.

ANCEUS (PRANISA) CERULIATA.—*Desmarest, Consid. sm. Crust.*, p. 284.

This is the female, probably, of *Anceus maxillaris*.

These two animals for a long time were considered as representing two distinct genera, and by some as separate families, their habits and appearance are so unlike each other. It now appears from the researches of M. Hepe, of Brest, who has the honor of first determining their relative connection with each other to be male and female. In early life the two resemble each other very closely, and they then live as parasites on the external surface of fish; as they grow older the male assumes the form of *Anceus*, and the female continues unaltered in the form of *Pranisa*. After quitting their parasitic mode of life they appear, as far as we can judge, particularly the male, to live without eating, for it has no mouth, and the mandibles are placed in the front of the head like antennæ. The female appears to exist as a huge oviviviparous, and when the young are matured the mother appears to be empty, and almost devoid of the traces of internal organs. The life of both male and female now appear, as far as usefulness is concerned, to be over, for although I have kept them alive for months in this condition they never appear to change, or seek or obtain food, but lie motionless and feeble.

## ISPODA NORMALIA.

### BOPYRIDÆ.

GENUS, BOPYRUS.—*Latrielle*.

Male. Small, narrow; antennæ rudimentary.

Female six times as large as the male. Pearshaped, unsymmetrical. Body much flattened.

BOPYRUS SQUILLARIUS.—*Latrielle, Hist. Nat. Crust.*, vii, p. 55, t. 59, f. 2.—*Bate and Westwood*, p. 218.

Frequently found under the shell of prawns and shrimps. From Polperro and off the coast.

GENUS, PHRYXUS.—*Rathke*.

Male Very minute and elongated, head transversely minute, with two dark minute eyes.

Female. Large inert nearly globular mass, with the segments scarcely indicated by depressions, with wide and oviparous plates.



PHRYXUS LOGIBRACHITUS.—*Bate and Westwood, p. 246.*

Specimens of this species have been taken at Polperro, upon an old *Galathea squamifera*, by Mr. Loughrin.

*ÆGIDÆ.*

GENUS, *ÆGA.*—*Leach.*

Oval in shape, antennæ short, three anterior pairs of legs robust, with hands. Four posterior pairs slender, pediform.

*ÆGABICARINATA.*—*Leach, Dict. Sc. Nat., xii, p. 349.*—*Bate and Westwood, p. 278.*

Taken in trawl refuse off Plymouth.

GENUS, *ROCINELLA.*—*Leach.*

Eyes very large, nearly uniting at the centre; second antennæ nearly one-third the length of body, rest like *Æga*.

*ROCINELLA DANMONIENSIS.*—*Leach, Dict. Sci. Nat., xii, p. 349.*—*Bate and Westwood, p. 391.*


This for half a century was known only by one specimen in the British Museum, named by Dr. Leach. Taken in Plymouth Sound. It has since been found at Polperro.

GENUS, *CORIOLANA.*—*Leach.*

Like *Rocinella*, but having the eyes at the margin of the head.

*CORIOLANA SPINIPES.*—*Bate and Westwood, p. 299.*

Taken at Falmouth by Dr. Leach and Mr. Cranch, and we have dredged it in Plymouth Sound.



**EURYDICE PULCHRA.**—*Leach, Lin. Trans., xi, p. 370.*—*Bate and Westwood, p. 310.*

Taken in pools on the coast.

Mr. Walker, of Brookfield, near Chester, says that "It is a most savage little beast. If you are a moment still in the water while bathing, dozens will fasten upon you and nip most unpleasantly. I have had to jump into the water again after coming out from bathing and splash violently to get rid of the hosts that had stuck to me while clinging to the side of the boat preparatory to getting in. They continue to bite after you are out of the water. I once put a wretched *Hyperia*, which I had taken from a *Rhizostoma*, into a small bottle with two *Eurydices*, the blood-thirsty little brutes attacked him like tigers, and soon sucked his shell clean."

#### LIBERATICA.

##### APELLIDÆ.

GENUS, JÆRA.—*Leach.*

First antennæ short, second more than half the length of the animal. Legs uniform, slender. Posterior portion of the body (pleon) united into one segment, short and round.

**JÆRA ALBIFRONS.**—*Montagu; Bate and Westwood, p. 317.*

It has been found especially abundant in crevices of rocks at half-tide near Falmouth, and in Plymouth harbour.

**JÆRA NORDMANNI.**—*Rathke, Fauna der Kryn., pl. 6, f. 1, 5.*—*Bate and Westwood, p. 322.*

Rathke obtained his specimen at Cape Parthenon, in the Crimea, under stones. Our specimens were found at Plymouth and South Wales.

GENUS, JANIRA.—*Leach.*

Like Jæra, but having the second antennæ and the posterior tail appendages very long.

**JANIRA MACULOSA.**—*Leach, Edin. Ency., vii, p. 434.*—*Bate and Westwood, p. 338.*

Not unfrequent on the coast. They have been taken at Falmouth, Polperro, and Plymouth.

GENUS, ASELLUS.—*Geoffroy*.

Body long, oval, like Janira. First antennæ short, second long. First pair of legs with hands, all the rest pediform, slender.

ASELLUS AQUATICUS.—*Linnaeus, Syst. Nat.*, ii, 1061.—*Bate and Westwood*, p. 343.

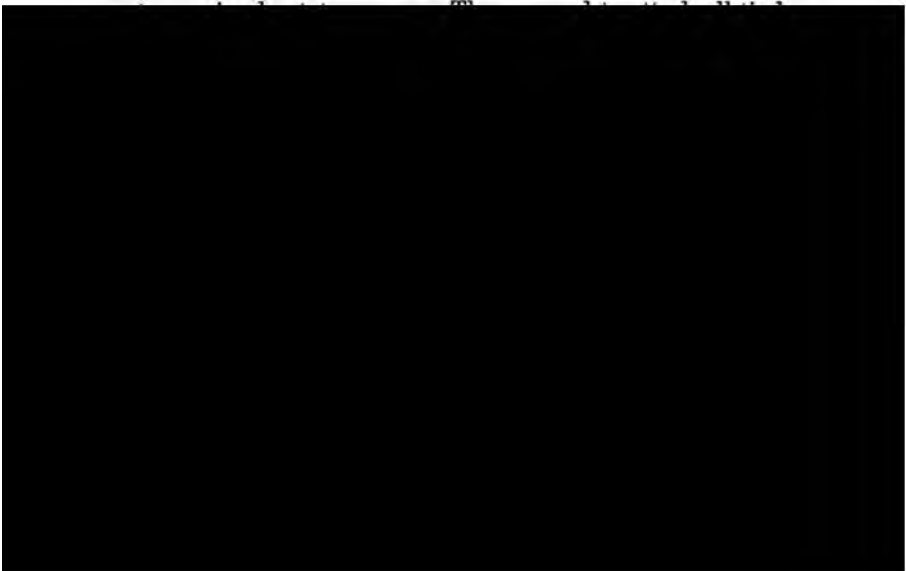
Common in freshwater ponds and ditches throughout the kingdom.

GENUS, LIMNORIA.—*Leach*.

Like Asellus, but with shorter segments to the body. Posterior portion divided into six segments.

LIMNORIA LIGNORUM. (The Gribble).—*Rathke, Skript. af Natur. Selsk.*, vol. 101, t. 3, f. 14 (1799).—*Bate and Westwood*, p. 351.

All round our coast, in submarine timber, which it eats with avidity. The bores are one fifteenth of an inch in diameter. Admiral Sir W. Drummond, when Superintendent of H.M. Dockyard, Devonport, afforded me every facility to examine the submerged timber in the arsenal and Sound. Assisted by the extensive knowledge and experience of Mr. Moore, the master shipwright of the yard, I was by comparison of dates, according to the length of time that the timber was submerged, able to arrive at a general conclusion that these animals destroyed the sunken wood at the average rate of one quarter to half an inch in depth a year. The earlier years were scarcely as much, but that with time the rate increased, so that a five inch solid balk of timber would be



Occasionally taken all round our coast. A colony of young animals was taken, attaching themselves to the spines of *Echinus sphaerus*, off Plymouth. The young of these animals for some time cling to the parent, hanging mostly about the antennæ.

### IDOTEIDÆ.

GENUS, IDOTEA.—*Fabricius*.

Body long and narrow, legs subequal; posterior portion of the body united into one segment, having no tail appendages posteriorly projecting.

IDOTEA TRICUSPIDATA.—*Desmarest, Cons. Crust., p. 289.—Bate and Westwood, p. 381.*

All along the coast. Among the largest specimens that we have seen—one inch and a quarter long—were some taken off the Dudman.

IDOTEA PELAGICA.—*Leach, Lin. Trans., xi, p. 365.—Bate and Westwood, p. 384.*

All round our coast, amongst weed. In Cornwall it has been taken near the Eddystone.

IDOTEA EMARGINATA.—*Fabricius, Ent. Syst. ii, p. 508.—Bate and Westwood, p. 387.*

Common among weeds all round the coasts of Europe. On the coast of Cornwall it was found among trawl refuse, and in the stomach of fish.

IDOTEA LINEARIS.—*Pennant, Brit. Zool. (1777), iv, 118, f. 2.—Bate and Westwood, p. 388.*

This species is not uncommon on many parts of the British coast. We have dredged it near Plymouth, where it is not uncommon. I received it from Falmouth. It generally assumes the colour of the weed on which it feeds.

IDOTEA PARALLELLA.—*Costa, d' Regno d' Napoli Crust, pl. xi, fig. 2.—Bate and Westwood, p. 391.*

This rather rare species has been taken at Falmouth and at Polperro. It bears a close resemblance to *Cleantis linearis*, of Dana, which was taken from the stomach of a fish in Rio Negro, North Patagonia.

IDOTEA ACUMINATA.—*Leach, Edin. Ency., vii, 438.—Bate and Westwood, 394.*

Mr. W. P. Cocks took some specimens in the trawl refuse, at Gyllyngvase, Falmouth, and some specimens are in the Hopeian Collection at Oxford, and labelled "South-west Coast of England." It has also been taken in Scotland.

IDOTEA APPENDICULATA.—*Risso, Hist. Nat. de l'Ent. Nereid, vol. v, p. 107, 14, f. 29.*

Not very common, it has been taken at Polperro.

### SPHÆROMIDÆ.

GENUS, SPHÆROMA.—*Latrielle.*

Animal capable of rolling itself into a ball. Head small. Eyes dorsally placed at the posterior angles. Antennæ short. Body wider than head. Posterior portion of the body (pleon) united into one segment.

SPHÆROMA SERRATUM.—*Fabricius, Mant. Inst., 1, p. 242.*—*Bate and Westwood, p. 405.*

This species is common under stones and among pebbles on all our coasts, from Kent to Cornwall, and in the Mediterranean. We have also dredged fine specimens in Plymouth Sound, and observed quantities in brackish streams in South Wales.

SPHÆROMA RUGICANDATA.—*Leach, Edin. Ency., vii, pp. 405-433.*—*Bate and Westwood, p. 408.*

From the Hebrides to the coast of France has this animal been obtained. In Cornwall we have found it at the mouth of the river Tamar.

**DYNAMENE RUBRA.**—*Leach, Dict. Sci. Nat., xii, p. 344.*—*Bate and Westwood, p. 419.*

Occurs all round our coast.

**DYNAMENE MONTAGUI.**—*Leach, Dict. Sci. Nat., xii, p. 344.*—*Bate and Westwood, p. 423.*

We have taken it among *fuci* between tide marks in Cornwall. It is tolerably common associated with other allied forms all round our coast, on rocky beaches.

GENUS, CYMODOCEA.—*Leach.*

Like *Dynamene*, but with a tooth in the centre of the emargination in the middle of the tail.

**CYMODOCEA EMARGINATA.**—*Leach, Dict. Sci. Nat., xii, p. 343.*—*Bate and Westwood, p. 428.*

Dr. Leach took his specimen at Plymouth, under Mount Batten. Mr. John Cranch found specimens less strongly granulose, at Falmouth.

GENUS, NÆSA.—*Leach.*

Like *Cymodocea*, but with the sixth segment of the body dorsally produced into a strong bidentate process.

**NÆSA BIDENTATA.**—*Adams, Trans. Lin. Soc., vol. v, p. 812, f. 3, 4*  
*Bate and Westwood, p. 431.*

Common probably all round the south western coast of England, including the rocky shores of Cornwall, where it has been found.

GENUS, CAMPECOPEA.—*Leach.*

Six segments, and with a single long dorsal tooth in the male.

**CAMPECOPEA HIRSUTA.**—*Montagu, Trans. Lin., vii, p. 71, t. 5, f. 8.*  
*Bate and Westwood, p. 434.*

This species was found by Montagu on the coast of Devonshire. We have taken it in some profusion at Torquay and Polperro, amongst the small dry *fuci* that exist on the surface of the rocks within reach of the spray of the sea, but where the sun appears to drain off all moisture.

**CAMPECOPEA CRANCHII.**—*Leach, Dict. Sci. Nat., xii, p. 341.*—*Bate and Westwood, p. 436.*

Found with the preceding, and is probably the female. Taken at Falmouth, as well as plentifully mingled with the former species in the localities named,

## ÆRO-SPIRANTIA.

## ONISCIDÆ.

GENUS, LIGIA.—*Fabricius*.

First antennæ rudimentary, second long. Tail appendage directed posteriorly, having two branches.

LIGIA OCEANICA.—*Lin. Syst. Nat., ii, p. 1061.—Bate and Westwood, p. 444.*

This species is common on all our coasts, running with agility, and when frightened simulating death. It does not live in water but on the sea-shore, within reach of the spray. It feeds on decaying animal and vegetable substances.

GENUS, PHILOSCIA.—*Latrielle*.

Ovate, sub-depressed. First antennæ rudimentary; second, eight-pointed; tail appendage with two unequal branches.

PHILOSCIA MUSCORUM.—*Scopelli, Entom. Carniol., p. 1145.—Bate and Westwood, p. 480.*

This species is widely distributed and very common, preferring dry situations under leaves, stones, and moss, near the sea-shore.

PHILOSCIA COUCHII.—*Kinahan, Nat. Hist. Rev., vol. v, 1858, p. 193, pl. 23, fig. 4.—Bate and Westwood, p. 452.*

This species runs with agility, but does not roll itself into a ball. It was discovered at Talland Cove, near Polperro. Prof. Kinahan, Trinity College, Dublin, and the writer, were returning from paying a visit to Mr. Couch, when the former found it at

the ground, and generally congregates in numbers. It feigns death, but does not roll itself up in the least.

**PHILOUGRIA ROSEA.**—*Koch, Deutsch Crust.*, 22, 16.—*Bate and Westwood*, p. 460.

It is tolerably abundant in gardens in Plymouth. This is the only habitat yet known in England. We have little doubt but that it only has to be looked for in Cornwall to be found. It is of a pretty rosy colour, and may be found in garden pots and crevices of the yards.

GENUS, ONISCUS.—*Linnæus*.

Head with large lateral lobes. Second antennæ eight-jointed; second joint detailed at the base. Tail appendage imbranched short.

**ONISCUS ASELLUS.**—*Lin. Syst. Nat.*, ii, p. 1061.—*Bate and Westwood*, p. 468.

Common throughout England, Scotland, and Ireland, under decaying vegetable and animal matter. Common near the sea.

GENUS, PORCELLIO.—*Latrielle*.

Second antennæ seven jointed. Tail appendage with outer branch trigonate, exposed; inner, small and concealed.

**PORCELLIO SCABER.**—*Latrielle, Hist. Nat. Crust. et Ins.*, vii, p. 45.  
—*Bate and Westwood*, p. 475.

This species runs with agility, and partially rolls itself into a ball when alarmed. It has been observed feeding on living caterpillars; frequenting moist places where decaying vegetation is found, also among sea-weed with *Ligia*. It is partial to growing vegetables, and enjoys ripe fruit. Common throughout England and Ireland.

I have little doubt but that most, if not all the British species might be found in Cornwall if they were looked for.

GENUS, ARMADILLO.—*Latrielle*.

Very convex. Capable of rolling itself into a ball. Second antennæ seven-jointed. Tail appendages not reaching beyond the margin of the body.

**ARMADILLO VULGARIS.**—*Latrielle, Hist. Nat. Crust. et Ins.*, vii, p. 48.—*Bate and Westwood*, p. 492.



This species is widely dispersed and very common in Devonshire and Cornwall.

In former times it was highly reputed for its supposed medicinal virtues, and was inserted as a medical agent in the older books of *Materia Medica*. Though discarded from the *Pharmacopæia*, it is still taken medicinally in some parts of Somersetshire.

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## ENTOMOSTRACOUS CRUSTACEA.

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### *OSTRACODA.*

The following species were dredged off the Cornish coast, and were examined and named by Mr. G. S. Brady, F.L.S.

|             |             |       |             |
|-------------|-------------|-------|-------------|
| Pontocypris | mytiloides  | ..    | Norman.     |
| „           | trigonella  | .. .. | G. O. Sars. |
| „           | angusta     | .. .. | Brady.      |
| Bairdia     | inflata     | .. .. | Norman.     |
| „           | acanthigera | ..    | Brady.      |
| Cythere     | pellucida   | .. .. | Baird.      |
| „           | tenera      | .. .. | Brady.      |
| „           | badia       | .. .. | Brady.      |
| „           | convexa     | .. .. | Baird.      |
| „           | finmarchica | ..    | Sars.       |
| „           | villtosa    | .. .. | Sars.       |
| „           | emaciatæ    | .. .. | Brady.      |

|               |              |    |    |                |
|---------------|--------------|----|----|----------------|
| Cytherura     | striata      | .. | .. | <i>Sars.</i>   |
| „             | similes      | .. | .. | <i>Sars.</i>   |
| „             | acuticostata | .. |    | <i>Sars.</i>   |
| Cytheropteron | punctatum    | .. |    | <i>Brady.</i>  |
| „             | nodosum      | .. |    | <i>Brady.</i>  |
| „             | multiforum   | .. |    | <i>Norman.</i> |
| „             | suberinatum  | .. |    | <i>Sars.</i>   |
| Bathocythere  | constricta   | .. |    | <i>Sars.</i>   |
| „             | turgida      | .. |    | <i>Sars.</i>   |
| Pseudocythere | caudata      | .. |    | <i>Sars.</i>   |
| Sclerochilus  | contortus    | .. |    | <i>Norman.</i> |
| Paradoxostoma | ensiforme    | .. |    | <i>Brady.</i>  |
| „             | abbreviatum  | .. |    | <i>Sars.</i>   |
| Polycope      | compressa    | .. |    | <i>Brady.</i>  |

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 ADDENDA.

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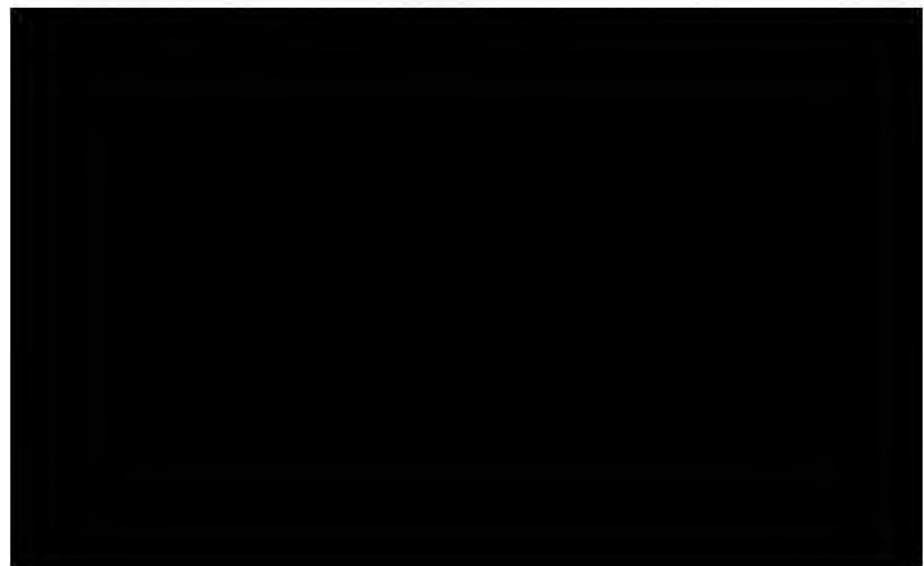
 MAMMALIA.

***Martes foina***—The Marten Weasel, or Marten Cat.—This has been recently shot near Delabole.

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 AVES.

***Oves Minuta***—The Little Crane.—This has lately been shot in the Parish of St. Dominick.



A  
CORNISH FAUNA;  
BEING A COMPENDIUM  
OF THE  
NATURAL HISTORY  
OF  
THE COUNTY,

*Intended to form a Companion to the Collection in the Museum of the Royal  
Institution of Cornwall.*

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PART II.  
containing  
THE TESTACEOUS MOLLUSKS.

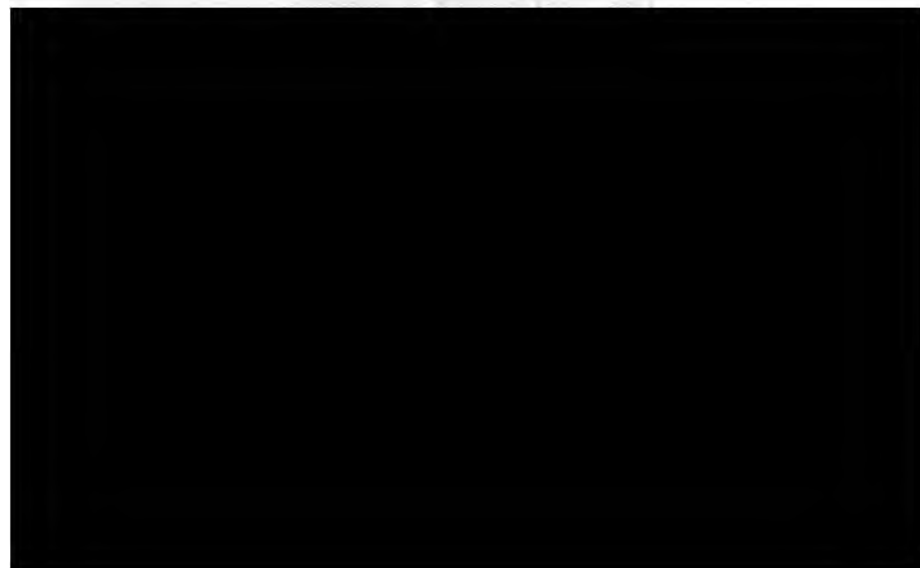


~~~~~  
BY JONATHAN COUCH, F.L.S., &c.

~~~~~  
TRURO:  
*Printed for the Royal Institution of Cornwall,*  
BY L. E. GILLET.

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1841.



## INTRODUCTION.

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LINNEUS in his system of nature, united all Animals destitute of a spinal column and articulated limbs, into a single class, of which Testacea, or creatures having an external shell constituted an important division ; but since his time the researches of Naturalists have proved, that such an arrangement is inconsistent with natural order.

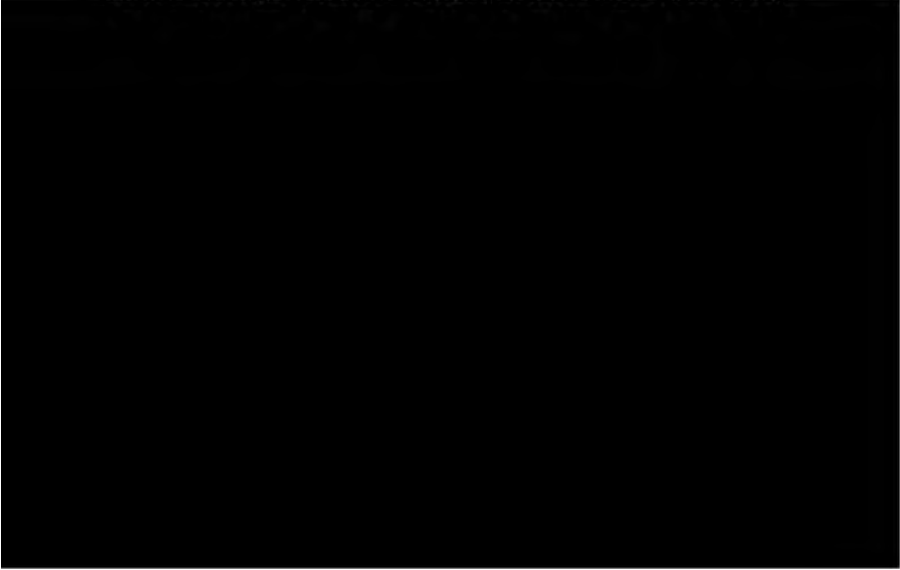
Of the Mollusca or soft bodied animals, comprizing within it this entire group, nearly all have a developement of the skin which covers their body, and which bears more or less resemblance to a mantle. The naked Mollusca are those in which the mantle is simply membranous or fleshy ; most frequently however, one or several layers of a substance more or less hard, is formed in its thickness, and increases in solidity as well as in extent, because the newer deposits always overlap the old ones. When this substance remains covered by the thickness of the mantle, it is still the custom to call the animals naked Mollusca. More generally however, it becomes so much developed, that the animal finds shelter beneath it ; and the covering is then termed a shell : the creature being denominated Testaceous, or in common language, a shell fish. It is rare however, to find a shell in which some filmy portion of the soft animal substance with which

the testaceous layer alternates, does not appear the external substance; but this Epidermis is no thin and brittle; and soon disappears under the friction to which most shell fish are exposed.\*

In the opinion of physiologists then, a shell is regarded as simply a portion, the external skeleton, of an animal; and the generic character of the molluscous inhabitant is estimated by the preponderance of its various parts.

In forming an arrangement designed to embrace the natural affinities, this is indeed the only method which can be adopted. That of Lamarck is entirely built on it; and as the classification of this eminent Naturalist is now chiefly followed in England: the shells of the British Museum being arranged by it, as well as the small collection presented to the Museum of the Royal Institution of Cornwall by the kindness of Sir Charles Lemon, Bart., M.P., it is judged proper that the present work, and the classification of the native specimens deposited in the Museum at Truro in illustration of it, should not form a departure from it.

Yet it must not be concealed that there are some things in the arrangement of Lamarck,

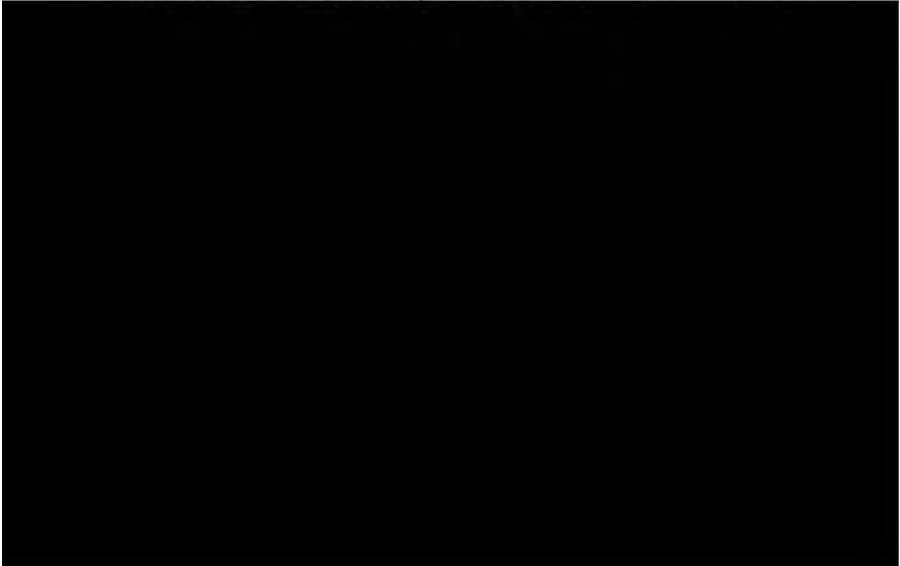


Another objection will strike the mind of such as may seek their occupation or amusement in examining the more solid forms contained in the Museum. As the modern classification arranges in close connection the Molluscs which may possess or are deprived of, a testaceous covering, or in which the shells, taken alone, may appear of very different forms, a discordancy may appear which shall seem far removed from our ideas of relationship in nature. The natural affinities, however, are more dependant on the soft than the solid portions, although unhappily the art has not yet been found, of preserving the latter in a state fit for examination. In some instances also, the shell alone is known to Naturalists: the inhabitant never having fallen in the way of an observer. But to obviate as much as possible all the difficulty likely to be thus encountered; and more especially for the benefit of those who, feeling an interest in the subject, may yet discover the philosophic arrangement to be rather an hindrance than an assistance, an attempt is here made to combine the spirit of the Linnean method with the arrangement of Lamarck, on which the work is founded. The manner of acquiring information may, and frequently ought to be, different from that in which it is retained; and Mr. Bicheno (*Trans. Lin. Soc.* vol. 15,) has shown how well fitted in this respect an artificial method is, to lead to the more easy and perfect acquisition of the natural.

It is with a view to this, that a rough outline of an arrangement is subjoined, by which it is hoped the student will be assisted in his endeavour to discover the place of a shell, the scientific name of which may be unknown to him. The distinction of kindred species, however, can only be made, by reference to good figures, combined



with accurate descriptions; the best or most easily accessible of which are given in the enumeration of each separate species, but of which those of Montagu are most earnestly recommended to the student. To the names of all the shells of which specimens are preserved in the Museum of the Royal Institution, a star is affixed, as in the first Part of the Cornish Fauna; and for the remainder the individual authority is given: in doing which it has been judged more proper to suffer the omission of some species of which there might be little doubt, rather than to insert any on insufficient authority. But notwithstanding the efforts which the Author has made to obtain specimens in their native abodes, and the kind assistance of some friends, whose names are partly acknowledged when speaking of the shells for which the acknowledgement is due, still to render the Fauna in this Department complete will require the contribution of several hands; for in the course of his researches the Author has found, that a small extent of coast will sometimes present a change of species; and some which are rare in one district, shall occur in abundance



## SUMMARY

OF THE

### GENERA OF CORNISH TESTACEOUS MOLLUSCS.

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**SEDENTARY ANNULATA:** With tubes or cases, encrusted with grains of sand and fragments of shells; or solid, calcareous and homogenous. This order comprizes Dentalium, Sabellaria, Terebella, Amphitrite, Spirorbis, Serpula, Vermilia. Vermetus much resembles the Serpulaceæ, but is separated on account of the different structure of the animal.

**CIRRHIPEDA, OR BARNACLES:** With many valves or plates, sessile or on a footstalk. From an opening capable of being closed proceed many slender, jointed, fringed tendrils, which are organs of prehension. It comprizes Tubicinella, Balanus, Acasta, Creusia, Pyrgoma, which are sessile; and, with footstalks, the Genera Anatifera and Pollicipes.

**CONCHIFERA OR BIVALVES:** With two principal valves or plates united by a hinge or ligament; and sometimes with accessory plates not belonging to the valves. It is divided into two orders; Conchifera Bimusclosa, with two internal separate and lateral muscular impressions; and Conchifera Unimusclosa, with only one muscle, which appears to pass through the body: the impression being about the centre of the shell.

*The first order, C. Bimusclosa, comprizes four Sections,*

- C. **CRASSIPEDA:** The shell when shut, gaping at the sides: Comprizing the Genera Teredo, Pholas, Gastrochæna, Solen, Mya, Anatina.
- C. **TENUIPEDA:** Gaping of the shell at the sides generally little: Comprizing the Genera Lutraria, Mactra, Amphidesma, Corbula, Saxicava, Venerupis, Sanguinolaria, Psamonobia, Tellina, Lucina, Donax, Capsa, Crassina.
- C. **LAMELLIPEDA:** Gaping none, but it is chiefly distinguished by the structure of the animal: the foot being broad and thin: Comprizing the Genera Cyclus, Pisidium, Cyprina, Cytheræa, Venus, Cardium, Hiatella, Iso-cardia, Arca, Pectunculus, Nucula, Unio.
- C. **AMBIGUA OR CHAMACRA:** The valves unequal, irregular: the hinge with one thick tooth, or toothless. The genus Isocardia was comprized in this section, but is now removed; there remains in it therefore, no British species.

*The second order, C. Unimusclosa comprizes three Sections,*

The first, with the Ligament marginal, sublinear, elongated on the edge: comprizing the Genera Modiola, Mytilus, Pinna, Avicula.

Second, Ligament not marginal, contracted into a short space below the beaks, visible, and not forming a tendinous cord under the shell; valves unequal, either in size or shape. It comprizes the Genera Lima, Pecten, Ostrea, Anomia.

Third, Ligament none, or formed by a tendinous cord supporting the shell: comprizing the Genus Terebratula.

# VIII

# SUMMARY.

**MOLLUSCA.** Many of the families of this order are destitute of a shell: the following characters will direct to the Families and Genera in which the native species are contained:

The shell formed in separate pieces, placed transversely across the dorsal surface: Chiton.

The shell of one depressed or conical piece, destitute of convolution. In one or two of the genera, the summit is a little bent, and in another, the internal cavity has a spiral plate: comprizing the Genera Patella, Emarginula, Fissurella, Pileopsis, Calyptræa, Ancyclus.

The shell inflated, aperture wide, the length of the shell, no Columella or projecting spire: Bullæa, Bulla.

The shell thin, depressed, the spire short, last whorl large, aperture large, oval: Vitrina.

The shell depressed and earshaped, the spire small, aperture wide oblong, margins separated: Sigaretus, which is distinguished from Natica and Neritina, by its more depressed form, by the width of the aperture, and the want of the umbilical callosity.

The shell spiral somewhat depressed, aperture rounded, the margin disunited, by the projection of the largest whorl without a canal: Zonites, Succinea.

The shell spiral, elevated, aperture entire, the margins disunited by the projection of the largest whorl, no canal: Bulimus, Zua, Pupa, Vertigo, Balea, Carychium.

The shell spiral, elevated, slender, aperture irregular, with the borders united, the lowest whorl not the largest: Clavus. The other forms of spiral shells, without a canal, will be found in the Genera Cyclostoma, Limneus, Nerita, Natica, Ianthina, Tornatella, Marginella, Voluta, Terebellum, Turbo, Sclaria, Trochus, Argulus, Phasianella, Turritella. With the spire very much depressed: Planorbis, Skenea.

Spiral shells, with a canal leading from the aperture: Cerithium, Pleurotoma, Fusus, Triton, Purpura, Succinum, Terebra.

Spiral shells, with a canal and an expansion into a wing of the outer border of the aperture: Rostellaria.

The shell oval, spire scarcely visible, aperture longitudinal, narrow, toothed on both sides, the extremities effuse: Cypræa.

**CEPHALOPODA, CUTTLEFISH TRIBE.** Some of the families of this order have no shell; others have it only internal. In the family of Orthocera, the shell is straight, or nearly so, with internal chambers separated by a tube. Orthocera easily to be

# CORNISH FAUNA.



*The species of which there are Specimens in the Museum are marked \**



## CORNISH SHELLS.

### CLASS I.



#### THE NINTH CLASS OF LAMARK'S AVERTEBRATE ANIMALS.



THE third Order of this Class, and first which possesses a Shell, is that of the

#### SEDENTARY ANNULATA.

They are formed of tubes either membranous or horny, encrusted outwardly with grains of sand and fragments of shells; or solid, calcareous and homogenous.

To distinguish these from various animals which in the state of Larva construct a case for their temporary protection, it is to be observed that the latter inhabit fresh water only, the former only the sea; and that the contained animal is without eyes, soft, lengthened, wormlike, with segments or transverse wrinkles, mouth nearly terminal, and without articulated feet. It never entirely quits the shell.

#### MALDANIA.

#### DENTALIUM.

**GENERIC CHARACTER:** Tube testaceous, nearly regular, slightly curved, gradually diminishing from one end to the other; open at both ends.

- \* **D. ENTALIS.** Turton's Linneus. Pennant's British Zoology, vol. 4. pl. 90. Borlase's Natural History of Cornwall, pl. 28, fig. 5. Montagu's Testacea Britannica, vol. 2, p. 494. Stewart's Elements of Natural History, vol. 2, p. 421. *Greater Tooth Shell.* The dead shell is not unfrequently found on many of our shores, about low water

mark. I have also obtained it attached to the beard of the greater Pinna, from the depth of above 40 fathoms; but I have not obtained the animal.

**D. DENTALIS.** Turt. Lin. *D. Striatum*. Mont. Test. Brit. vol. 2, p. 495. *Striated Tooth Shell*. Rare, found by, Montagu at Falmouth; and by myself attached to the Byssus of a Pinna.

**D. GADUS.** Mont. Test. Brit., vol. 2, p. 496, pl. 14, fig. 7.

Montagu says it occurs at a distance from land, attached to the sounding lead of ships in the Channel. On this account I have ventured to class it with Cornish Shells.

It has been supposed that the habit of this genus is to remain fixed in the sand or ooze, and there to protrude their organs for the purpose of laying hold on whatever food may chance to come near; retreating into the shell on the approach of danger, after the manner of the *Terebellæ* and *Serpulæ*. But the observations of Mr. Lansdowne Guilding on a species which he examined in the West Indies, tend to overturn this opinion, and to displace the animal from its situation in the present classification. Placed in a vessel of water, observes this Gentleman, it drew itself along on its side; but this may have been owing to the shallow layer of sand in which it endeavoured to bury itself in the soup plate which contained it, where it might not have been able to assume its proper attitude. The creature moves tolerably quick, by sudden interrupted steps. When disturbed it retreats quickly into its shell, which has no operculum, as the *Serpulidæ*. After a time the cloak is protruded, the tentacula set in motion, and the vermiform active foot partially thrust out to explore its path. When it wishes to proceed on, the foot with its netal-shaped arms closed

## SABELLARIA.

**GENERIC CHARACTER:** Tubes numerous, composed of sand and fragments of shells, united into a common mass by means of a glutinous substance excreted by the animal; the orifices separate to each individual, cup-shaped.

- \* **S. ALVEOLATA.** Sabella A. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 92, fig. 162, the figure from an injured specimen. Stew. Elem. Nat. Hist., vol. 2, p. 423. Sabellaria A. Quarterly Journal of Science, vol. 14, pl. 3, fig. 4. Mont. Test. Brit., vol. 2, p. 540. *Clustered Sand Tube.* Common, and in favourable situations increasing so as to cover a large extent of rock; over which it is impossible to walk without crushing multitudes of these frail habitations. The situation chosen may not at first sight appear the best, for a creature which requires a considerable quantity of sand, before it can be provided with an habitation, which is placed on the bare rock, at the distance of many feet, or even yards, from the materials. But a bed of sand, though affording materials, would prove a bad foundation for the structure. Trusting therefore to the waves for what they may bring within reach, the building is placed on the elevated surface, and the most successful season of erection is in stormy weather. In the first stage of existence, and when only a single tube is produced, the appearance of this tube is much like that of *Vermilia Triquetra*, except in the nature of the materials employed. The orifices of the subsequent formations are more rounded and turned up.

Reasons have been given why animals of this and the following genus should be excluded from a work which treats only of shells and their molluscous inhabitants; since these resemble the latter in no respect, and the former only remotely. But faint as is the likeness, it is not altogether visionary, and as it tends to show the links through which the affinities of nature are continued, it deserves our attention. The *Arenicolæ*, as Cuvier terms them, are not the only creatures in which there is no adhesive attachment between the case and its inhabitant. But the process of construction of these slightly organized habitations is not exceedingly remote from that of the most complete and beautiful of testaceous structures. In the latter, for the purpose of growth, the mantle is applied to the surface of the structure, even beyond the portion to which it actually adheres; and the exudation of carbonate of lime with animal matter, is plastered on it. But in the case of the present family, the process is so far different, that animal gluten alone is poured out; and this being fashioned into

a tube by the action of the animal, the arms or tendrils are employed in laying hold of the particles of sand and applying them to the yet adhesive surface.

#### TEREBELLA.

**GENERIC CHARACTER:** Tube lengthened, cylindrical, slender and pointed at the base; membranous, with grains of sand and fragments of shells adhering round it; open only at the top.

- \* **T. CHRYSODON.** Sabella C. Mont. Test. Brit., vol. 2, p. 546. Common in firm sand, near low water mark; in some places thickly studding the ground.
- \* **T. CONCHILEGA.** Sabella C. Pen. Brit. Zo., vol. 4, pl. 26, lower figure. Stew. Elem., vol. 2, p. 423. Mont. Test. Brit., vol. 2, p. 547. On dead shells from deep water.
- \* **T. LUMBRICALIS.** Sabella L. Stew. Elem., vol. 2, p. 423. Mont. Test. Brit., vol. 2, p. 549. Common, on shells, from deep water.
- T. CIRRATA.** Sabella C. Mont. Test. Brit., vol. 2, p. 550. This is the largest, stoutest, finest, but most brittle, of the British species. It lives in deep water, and is probably less rare than it seems to be.

The above form the whole of the species comprized in the kindred Genera Sabellaria and Terebella that I can venture to include in the list of Cornish Shells. But although differently allied, Siphunculus Strombus (Fleming's British Animals, p. 491) must also be enumerated among creatures which construct their habitation of agglutinated sand. This it does by straitening the orifice of the shell of Rostellaria Pes Pelecani: and forming it into an elevated

## SPIRORBIS.

**GENERIC CHARACTER:** Tube testaceous, twisted into a round flattened spire; lower surface flat, and fixed to another body. Operculum pedunculated, flat at the top, situate between the branchiæ.

- \* **SP. NAUTILOIDES.** *Serpula Spirorbis.* Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 91, fig. 155. Stew. Elem., vol. 2, p. 422. Mont. Test. Brit., vol. 2, p. 498. Common on stones, shells and other substances.

**SP. SPIRILLUM.** *Serpula Sp.* Turt. Lin. Stew. Elem., vol. 2, p. 421. Mont. Test. Brit., vol. 2, p. 499.

Montagu says, this species has much the habit of the preceding, but is distinguished from it by its glossy appearance, being more cylindric, and not spreading at the base. Common on shells, stones and other substances.

- \* **SP. GRANULATA.** *Serpula G. and Sulcata.* Turt. Lin. Mont. Test. Brit., vol. 2, p. 500. Common on rocks and stones.

- \* **SP. CARINATA.** *Serpula C.* Mont. Test. Brit., vol. 2, p. 502. It is distinguished from *Sp. Nautiloides* by the angulated shape of the outer whirl, which is formed like that of *Vermilia Triquetra*, but regularly spiral. Not uncommon on shells.

- \* **SP. CORRUGATA.** *Serpula C.* Mont. Test. Brit., vol. 2, p. 502. Not uncommon.

- \* **SP. MINUTA.** *Serpula M.* Mont. Test. Brit., vol. 2, p. 505.

Montagu observes, this very minute species is also an heteroclitical shell, and not easily distinguished from *S. Heterostropha*, except by its inferior size, and habits; this affects only the *Corallina officinalis*, frequently in abundance, both on stalks and branches.

**SP. LUCIDA.** *Serpula Reflexa* and *S. Vitrea.* Turt. Lin. S. L. Mont. Test. Brit., vol. 2, p. 507.

Montagu says, it is peculiar to some species of *Sertularia*, especially *S. Abietina* and *S. Argentea*; and on them not uncommon.

## SERPULA.

**GENERIC CHARACTER:** Tube testaceous, creeping, tapering, irregularly twisted, sometimes slightly keeled; fixed to another body.

- \* **S. VERMICULARIS.** *S. Intricata.* Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 91, fig. misplaced, 158. Stew. Elem., vol. 2, p. 422. Mont. Test. Brit., vol. 2, p. 509. Common.

- \* **S. TUBULARIA.** Mont. Test. Brit., vol. 2, p. 513. The most beautiful, and commonly the largest, of the British *Serpulæ*. It comes from deep water, and is scarcely common.



## VERMILIA.

**GENERIC CHARACTER:** Tube testaceous, tapering, irregularly twisted, fixed to some other body; margin of the aperture toothed.

- \* **V. TRIQUETRA.** *Serpula Contortuplicata.* Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 91. fig. misplaced, 157. Stew. Elem., vol. 2, p. 422. S. T. Mont. Test. Brit., vol. 2, p. 511. Pennant's figures, in addition to the error of the references, are from imperfect specimens. Common.

The principal authority for the specific distinctions of the British species of this family, is Montagu, who has closely studied them. It seems proper to remark, however, that the direction in which the spire may turn, to the right or left, may not prove so unchangeable a mark as to warrant its forming a specific distinction.

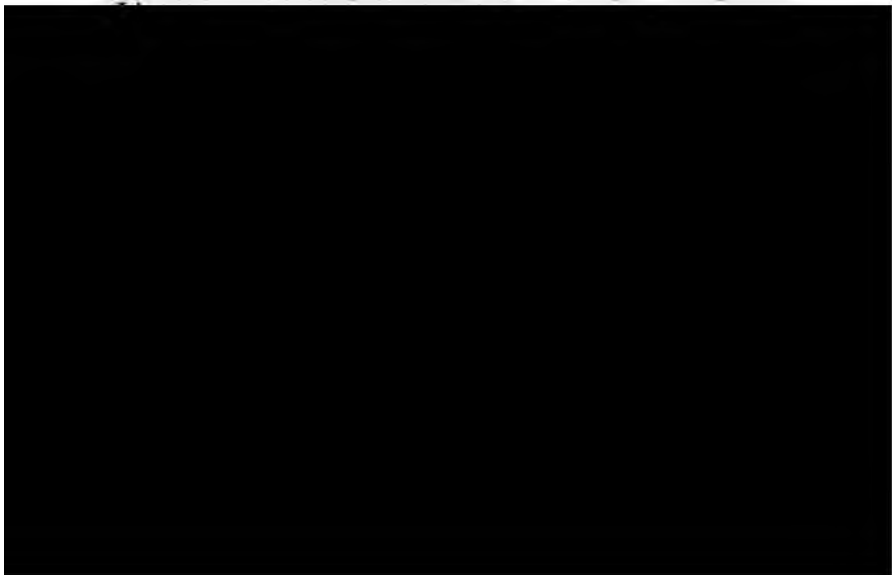
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 CLASS II.

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 CIRRHIPEDA.

The shell with many valves, sessile or on a stalk; the valves or plates unequal, covered inwardly by the mantle. The animal is soft, without head or eyes, testaceous, fixed. Body not articulated, having a mantle, with cirrous, many jointed, tentacular arms. Number of the arms various, unequal, in two rows, each composed of two setaceous, jointed, fringed cirri, supported on a common footstalk. It is the class Cirrhopoda of Cuvier, and genus *Lepas* of



testaceous plate. The opening on the top closed by four moveable valves, inserted near the base of the inside of the shell.

- \* **B. COMMUNIS.** Lepas Balanus. Turt. Lin. L. Cornubiensis. Pen. Brit. Zo., vol. 4, pl. 37, fig. 6. B. C. Mont. Test. Brit., vol. 1, p. 66. Stew. Elem., vol. p. 363. *Acorn shell.* Common on rocks; clustering.
- \* **B. BALANOIDES.** Lepas B. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 37, fig. 5. Stew. Elem., vol. 2, p. 364, B. B. Mont. Test. Brit., vol. 1, p. 7. Covering rocks, in multitudes.
- \* **B. PUNCTATUS.** Mont. Test. Brit., vol. 1, p. 8, and pl. 1, fig. 5. This has generally been confounded with the preceding: a circumstance not surprizing, from the little attention hitherto paid to these animals, and the difference of their form from variety of position, clustering and age.
- B. TINTINNABULUM.** Mont. Test. Brit., vol. 1, p. 10.

Montagu describes this shell from specimens attached to the bottoms of ships from warm climates; but doubts of its being a native of our seas. I have found numerous specimens, answering to his description in all but size, attached to the surface of the Nidus of Buccinum Undatum, thrown on shore on the beach, and consequently from no great distance in the ocean. A comparison of these specimens, scarcely a line in diameter, with the foreign shells, which are among the largest of the genus, may lead to a suspicion that they are not certainly identical; in which case the Cornish will be a new species; but this must be left for further investigation. The colour of this shell is pure white; of the inner valves purple.

#### ACASTA.

**GENERIC CHARACTER:** The shell sessile, oval, sub-conic; formed of separable pieces, forming six unequal plates; the bottom a convex plate externally. Cover with four valves.

- A. MONTAGUI.** Crouch's Introduction to Lamarck's Conchology, pl. 1, fig. 15. This species does not fix on solid bodies, but lives embedded in sponge. It is obtained from deep water, and is scarcely common.

#### CREUSIA.

**GENERIC CHARACTER:** The shell sessile, fixed, orbicular, with four plates, which are unequal, united by distinct sutures. Cover internal, with four valves.

- \* **C. STRIATA.** Lepas Intertexta. Turt. Lin. L. Striata. Pen. Brit. Zo., vol. 4, pl. 38, fig. 7. Balanus S. Mont. Test. Brit., vol. 1 p. 12. L. S. Stew. Elem., vol. 2, p. 364. Common on shells, rocks, and the stalks of seaweeds where not often uncovered by the tide: clustering, but not so as to influence the regularity of growth.

## PYRGOMA.

**GENERIC CHARACTER:** Shell sessile, of one piece sub-globular, bulging, convex above, the top perforated with a small orifice, which inclines to oval. Cover with four valves, scarcely apparent.

- \* **P. ANGLICUM.** Magazine of Natural History, O. S., vol. 1, p. 475. It is rare that a full grown and complete *Caryophyllia Smithii* (a species of coral) is brought from moderately deep water, without having a few specimens seated on its diverging plates; and I have rarely seen it under other circumstances.

*PEDUNCULATED CIRRHIPEDA.*

The shell supported by a tubular stalk, the base attached to some foreign body.

## ANATIFERA.

**GENERIC CHARACTER:** The shell compressed at the sides, with 5 plates, which are contiguous and unequal; the lower side plates largest. This genus is also termed *Anatifa*, and *Anatifer*.

- \* **A. LEVIS.** *Lepas Anatifera*. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 38. fig. 9. Stew. Elem., vol. 2, p. 364. Mont. Test. Brit., vol. 1, p. 15. A. L. Crouch's In., pl. 1, fig. 18. *Barnacle*.

This which is termed the Duck or clustering Barnacle, is the largest of the British species, sometimes measuring from the base of the shell to the point  $2\frac{1}{2}$  inches; and to distinguish it from the next, with which it is commonly confounded, it should be remarked as being more robust, and larger, while the stalk is comparatively shorter. The union of the larger plates is equal, and their margin rises

the other this is never observed. The young thus adhering are never of the full size of the parent: a circumstance not easily accounted for; as it seems impossible that they should at any time after their first stages of growth, be able to loosen their hold and assume a new station.

The researches of Mr. Thompson have made the history of this class of animals important, by showing their close affinity with Crabs and Lobsters.

\* **A. ANSERIFERA.** Lepas A. Turt. Lin. Mont. Test. Brit., vol. 1, p. 16. Stew. Elem., vol. 2, p. 364. *Common Barnacle.* Common on floating wood that has been long at sea. Its distinctions from the A. Levis have been already pointed out. The stalk, which is from a foot to 18 inches in length, is capable of voluntary motion, including contraction and extension; and a point of support for lateral bending is afforded by compressing a portion of fluid into the requisite limited space.

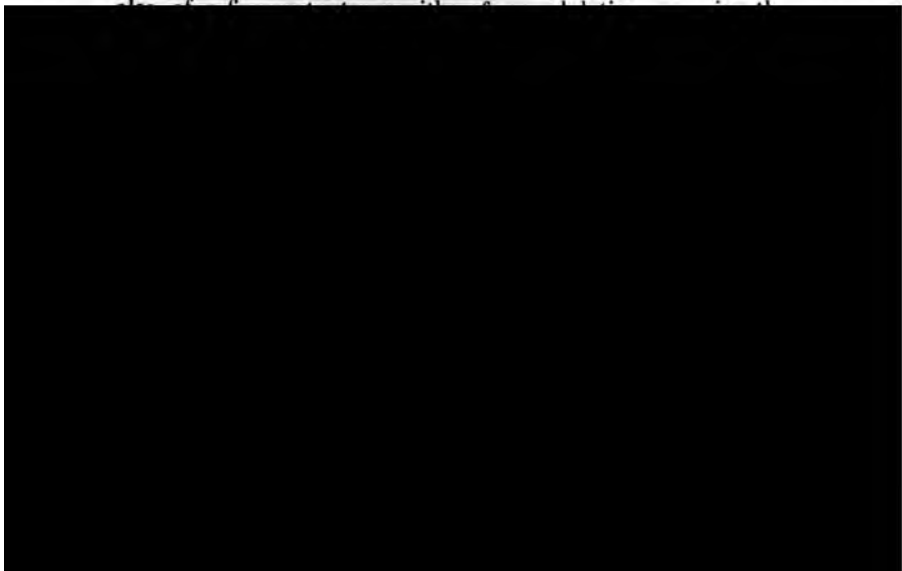
\* **A. FASCICULARIS.** Lepas F. Mont. Test. Brit., vol. 2, p. 557. In no volume to which I have access do I find a satisfactory description of this species; it may therefore properly find a place here. Length of the shell, 7 tenths of an inch, depth  $5\frac{1}{2}$  tenths; the thickness or inflation considerable, the cross segment forming an oval posteriorly; texture of the plates thin as tissue paper, and easily broken. The dorsal plate is remarkably arched, wide, and terminating circularly above the stalk. The orifice gaping. Anterior lateral plate small, slender, jagged at its point; the larger plate with an everted hinder margin. Colour whitish, with tints of blue, the soft parts appearing through the texture. The stalk short, small, fixed in a tumid bed of soft membranous substance; and the animals project at right angles to the substance on which they are fixed; adhering in clusters, but each standing out in as opposite a direction as possible from those with which it is associated.

This is a rare species, since it was but barely known to the industrious researches of Montagu. I have met with it attached to the stalk of sea weeds; and once in considerable quantity, thrown on shore in a storm. It is a stranger circumstance that I possess some specimens, intermingled with the equally rare species, A. Sulcata, and both attached to a feather of the wing of a gull.

**A. SULCATA.** Lepas S. Mont. Test. Brit., vol. 1, p. 17, pl. 1, fig. 6. Length of the shell 7 tenths of an inch, depth  $4\frac{1}{2}$  tenths. The larger plates are moderately inflated behind, overlapping at the hinge below; the anterior plates small; dorsal plate not running to the point. The side plates are thickly covered with raised lines proceeding

from the inferior point of the junction of these parts, and directed obliquely upward to the edge; where they are opposite to similar lines on the smaller plate, which converge on a part of the superior margin a little distant from the point: from which latter portion similar lines pass obliquely upward and backward to the same space. The dorsal plate has a distinct smooth ridge or keel; but possesses longitudinal lines passing from behind forward to the edge. Colour a leaden blue, the stalk short, almost sessile.

Montagu once found this species, in an immature state, attached to the *Gorgonia Flabellum*: a species of coral not yet beyond a doubt, as a native of the British Seas. Some specimens were presented to me by a young Lady, from the coast of Ireland; and on the following day I was so fortunate as to find a collection of them, attached in clumps on both sides of a piece of the bark of a tree. Comparing these with Montagu's description and figure, I find the terminal side plate less sharp, and the characteristic raised lines more numerous; for in Montagu's specimens there were no more than 15, which he terms strong ribs; while in the larger individuals from which my description was drawn, there were 28 in one, and 29 in another. On the lesser side plate I counted 17, instead of seven or eight as noticed by Montagu. All of them were of an equal marking, so as to give the specimens an elegant appearance: the plates closely joined, without an appearance of membrane; and the lines on both plates continuous, instead of forming an angle, as in Montagu's figure. The Irish specimens in this respect approach more nearly to the engraving; their breadth being greater than the Cornish, in comparison with their length: the plates



of East Looe, to whom our museum is indebted for much valuable assistance, presented to me the feather already referred to when speaking of the last species:—on which, along the stem of the vane, were several specimens of this species, standing in clumps, and of about their full growth. It is clear that they must have seized on this feather, as well as on the piece of cork when floating on the surface; and that in their first existence they are singly dotted over the surface. Their clustering afterwards is in the way of pululation; and though closely set in the bottom, their subsequent growth, is in every imaginable angle of direction.

#### POLLICIPES.

**GENERIC CHARACTER:** The shell compressed at the sides, many valved, the plates rather contiguous, unequal; in number 13, or more; the lower side valves smallest.

\* **P. SCALPELLUM.** Lepas S. Turt. Lin. Mont. Test. Brit., vol. 1, p. 18, pl. 1, fig. 3. Stew. Elem., vol. 2, p. 365.

This species has been described as scarce; but I have found it common, if not abundant. It is found on the branches of *Gorgonia Verrucosa*, and *Dynamena Filicula*, two species of Corals; and somewhat less frequently, but of greater size, on the stone to which they are attached; but in every case, it stands erect, and singly, without clustering.

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### CLASS III.

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#### CONCHIFERA.

The shell always bivalve, wholly or partly covering the animal; sometimes free, sometimes fixed; the valves mostly joined at the margin by a hinge or ligament. The shell is sometimes enlarged by testaceous or accessory pieces, not belonging to the valves.

This class is divided into two orders: *Conchifera bimusculosa*, and *C. Unimusculosa*.

#### ORDER I.

##### CONCHIFERA BIMUSCULOSA:

So named from having, in the interior, two separate and lateral muscular impressions. It is divided into four sections: *C. Crassipeda*; *C. Tenuipeda*; *C. Lamellipeda*; and *C. Ambigua*, or the *Chamacea*.

## SECTION I.

**CONCHIFERA CRASSIPEDA:**

The foot of the animal thick, the shell gaping considerably. This section contains four families: Tubicolaria, Pholaderia, Solenacea, and Myaria.

**TUBICOLARIA.**

Inhabiting a tube.

**TEREDO.**

**GENERIC CHARACTER:** Tube testaceous, cylindrical, flexuous, open at both ends, not belonging to the shell, and covering the animal. Shell bivalve, placed posteriorly, on the outside of the tube.

- \* **T. NAVALIS.** Lin. Pen. Brit. Zo., vol. 4, p. 147. Stew. Elem., vol. 2, p. 423. Mont. Test. Brit., vol. 2, p. 527. Fleming's British Animals, p. 454. The posterior valves or pallets, Crouch's Intr., pl. 2, fig. 10, b, the jaw 10 a. *Auger Worm.*

This animal enters wood that has been penetrated by Sea Water, and soon enlarges its habitation; devouring tortuously in the direction of the fibres, and filling its intestines with the saw dust, to a state of great distension. It penetrates to the length of about a foot, in a chamber something less than an inch in diameter; and is capable of retracting itself, or turning in an inclined direction, to avoid any formidable obstacle. At first these animals do not eat into each others chambers; and when this has happened, they retreat and take a new direction. But when their numbers, and the complexity of their habitations have increased, the substance of the wood may be found pierced in all directions, so as at last to fall asunder; and like the fabled hero of

thin as a film, more especially towards the anterior part. Yet even in its very immature state, the tube of this species has near the tail, some distinct testaceous chambers: showing the fact that the body makes some progress beyond simple growth: a circumstance less clearly established in the common Auger Worm. The chief, or at least, the most clear and easy distinction between this species and *T. Navalis* will be found in the structure of their jaws: the cutting portion of which, or triangular projection, in the latter species being bent obliquely downward, but not nearly so much so as in *T. Malleolus*. In *T. Navalis*, fine, slight, closely placed lines radiate backward from this point to where the upper portion of them joins a series of similar striæ that pass upward in an arched manner, each line turning off backward into a flat space which ends abruptly. The jaws of *T. Malleolus* are more glossy, and the divergent lines of the triangular portion are less numerous and more distinctly separate; the striæ being more prominent, with wider spaces between them. The perpendicular lines also, which run at right angles to the former, are also more distinct, though examined in a much smaller specimen; and turn off backward in separate, but not as in the former, in wide arches.

*T. NANA*. *Flem. Brit. An.*, p. 455; whose sole authority is Turton. The shell is four tenths of an inch in diameter, in both directions, though too irregular to be termed round; very deep in the hollow, almost globular. A slender, but very distinct rib passes round the concavity, from the slight but firm oblique tooth at the portion that is incurved, to the opposite margin. This rare species was found in a piece of oak, thrown on shore at Gorran: communicated by Mr. Peach.

#### *PHOLADARIA*.

Shell without a tubular sheath, gaping anteriorly; ligament external, and with accessory pieces of shell not belonging to the valves.

#### *PHOLAS*.

**GENERIC CHARACTER:** Shell bivalve, equalvalved, transverse, gaping at both sides, having accessory pieces affixed above or below the hinge. The inferior or posterior margin of the valves reflected outward.

*P. DACTYLUS*. *Turt. Lin. Borlase's Nat. Hist. Corn.*, pl. 28, fig. 31. *Pen. Brit. Zo.*, vol. 4, pl. 39, fig. 10. *Mont. Test. Brit.*, vol. 1, p. 20. *Flem. Brit. An.*, p. 457. This shell is a borer, commonly of the hard rock, in which it lives at ease, and by which it is protected from injury. I have only seen it as taken from slate rock on the west side of Pridmouth Cove, not far west of Fowey.



- \* **P. LAMELLATA.** Flem. Brit. An., p. 456. Numerous in a reddish sandstone, from deep water, drawn up by a fisherman's hook. Mr. Bellamy says it is not uncommon at Plymouth.

#### GASTROCHÆNA.

**GENERIC CHARACTER:** The shell bivalve, the valves equal, rather wedge shaped, gaping very much; the anterior aperture large, oval, oblique; scarcely any aperture posteriorly. Hinge, linear, marginal, without teeth.

- G. HIANS.** Mya Dubia. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 44, fig. 19. M. Pholadia. Mont. Test. Brit., vol. 1, p. 28. G. H. Flem. Brit. An., p. 458. Scarce. I have seen it taken alive from the cavity of a stone from deep water.

#### SOLENACEA.

The Shell transversely elongated, gaping only at the lateral extremities. Ligament external. Accessary pieces none.

#### SOLEN.

**GENERIC CHARACTER:** Shell bivalve, the valves equal, transversely elongated, gaping at both ends; beaks small, not projecting. Ligament external, near the hinge.

- \* **S. SILIQUA.** Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 45, fig. 20. Mont. Test. Brit., vol. 1, p. 46. Stew. Elem., vol. 2, p. 369. Flem. Brit. An., p. 459. *Razor Shell.* From the specimens and fragments found lying on the shore, this animal seems not uncommon; but several circumstances render it not easy to be found in its living state.

- S. PELLUCIDUS.** Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 46, fig. 23. Mont. Test. Brit., vol. 1, p. 49. Flem. Brit. An., p. 459. Rare; and the more so, that it must be

left valve, broadly compressed, rather rounded, and projecting almost vertically; a cardinal pit in the other valve. Ligament internal, inserted in the prominent tooth and the corresponding pit.

**M. TRUNCATA.** Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 41, fig. 14. Stew. Elem., vol. 2. p. 336. Mont. Test. Brit., vol. 1, p. 32, Flem. Brit. An. p. 162. Rare.

#### ANATINA.

**GENERIC CHARACTER:** Shell transverse, with nearly equal valves, gaping at one or both sides; one naked, broad, spoonshaped, cardinal tooth, projecting internally, in each valve, and receiving the ligament. In many species a lamina or falcated rib runs obliquely below the cardinal teeth.

**A. MYALIS.** Mya Pubescens. Mont. Test. Brit., vol. 1, p. 40. Amphidesma P. Flem. Brit. An., p. 431. Anatina M. Crouch's Introd., pl. 4, fig. 1.

Montagu says, "this species is not uncommon, of small size, taken up with sand from Falmouth harbour—one we received from Plymouth, taken by dredging, was 2 inches broad, and  $1\frac{1}{4}$  long." It is otherwise rare; but I obtained it at Falmouth, above  $2\frac{1}{2}$  inches broad.

**A. DECLIVIS.** Marked for me at the British Museum, but which I am not able with confidence to refer to any of the usually received synonyms of this shell: considered, as it usually is, as the young state of the last species. Pennant, Montagu and Fleming, are entirely at variance on this subject; and until more information is obtained, it is best to report it simply, as not of common occurrence within the sphere of my observation.

#### SECTION II.

The foot small, compressed; Lobes of the mantle scarcely or not at all united in front. Lateral gaping of the shell generally inconsiderable.

#### MACTRACEA.

The shell with equal valves, generally gaping at the lateral extremities. Ligament internal, with or without an external ligament.

#### LUTRARIA.

**GENERIC CHARACTER:** The shell with unequal sides, transversely oblong or rounded, lateral extremities gaping; hinge with one tooth folded in two; or two teeth, one of which is simple, with an adjoining, deltoid, oblique pit, projecting inwards; no lateral teeth. Ligament internal, affixed in the pits.

\* **L. VULGARIS.** Mactra Lutraria. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 52, fig. 44. Stew. Elem., vol. 2,

p. 377. Mont. Test. Brit., vol. 1, p. 99. L. V. Flem. Brit. An., p. 464. The separate valves are found thinly scattered along all our coasts.

L. HIANS. Mactra H. Mont. Test. Brit., vol. 1, p. 101. Mya oblonga, Turt. Lin. L. H. Flem. Brit. An., p. 465. Rare or local. Montagu found it not uncommon in the river between Truro and Falmouth.

#### MACTRA.

**GENERIC CHARACTER:** Shell transverse, the sides unequal; the form subtriangular, gaping very little at the sides; beaks prominent. One compressed, grooved, cardinal tooth in each valve, with an adjoining pit projecting inwards; two compressed, entering, lateral teeth, near the hinge. Ligament internal, inserted in the cardinal pits.

\* M. SOLIDA. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 50, fig. 43. Stew. Elem., vol. 2, p. 377. Mont. Test. Brit., vol. 1, p. 92. Flem. Brit. An., p. 26. Abundant along our southern coast.

On the beach at Helford, near Falmouth, I obtained a complete shell and two separate valves of, what must be considered, a separate species or a variety of the above; as future research shall determine. It is of the ordinary size and appearance of the milk white specimens of M. Solida; but from each umbo proceeds to the posterior margin a deep channel, which forms an indentation at their place of meeting. I had no opportunity of examining the animal.

\* M. TRUNCATA. M. Subtruncata. Mont. Test. Brit., vol. 1, p. 93. M. Stultorum. Pen. Brit. Zo., vol. 4, pl. 52, fig. 42. Stew. Elem., vol. 2, p. 377. M. T. Flem. Brit. An., p. 427. I have found it larger than the last named species; frequenting similar situations, but less

one or two teeth, and a narrow pit for the internal ligament. Ligament double; one external, short, the other internal, fixed in the cardinal pits.

- \* **A. COMPRESSUM.** *Mactra Listeri*. Turt. Lin. Stew. Elem., vol. 2, p. 377. *Venus Borealis*. Pen. Brit. Zo., vol. 4, p. 96. *Mactra C.* Mont. Test. Brit., vol. 1, p. 96. *A. C.* Flem. Brit. An., p. 432. On heaps of sand on the banks of Looe river, and probably in other similar situations; but scarcely abundant.

- \* **A. PRÆTENUA.** *Mya P.* Mont. Test. Brit., vol. 1, p. 41. *A. P.* Flem. Brit. An., p. 432. "It is not uncommonly dredged from Falmouth harbour, but mostly single valves." Montagu. I obtained a specimen with the valves united.

- A. DISTORTUM.** *Mya D.* Mont. Test. Brit., vol. 1, p. 42. pl. 1, fig. 1. *A. D.* Flem. Brit. An., p. 432. "We first noticed this species at Falmouth, amongst the sand dredged from the harbour for manure, and have since found it lodged in hard limestone at Plymouth, into which it had bored like the *Pholas*; probably the occasion of its distorted growth." Montagu. I have found it not uncommon in stones from deep water; and ascribe the distorted growth to its occupying holes not made by itself, and which in time become too straight for it. Animals which form their own habitations in the substance of the stone, are commonly found to enlarge them according to their growth; and maintain the most delicate structure of their shells without injury.

- A. CONVEXUM.** Turt. Lin. Flem. Br. An., p. 431. Obtained from Mr. Peach at Gorran.

Other species arranged by Fleming in this genus, will be found in the genus *Anatina*.

### **CORBULEA.**

Valves of the shell unequal; ligament interior.

### **CORBULA.**

**GENERIC CHARACTER:** The shell regular, valves unequal, as also the sides; closed or very slightly gaping. One large, conical, curved, ascending tooth in each valve, with a pit beside it; no lateral teeth. Ligament internal, inserted in the pits.

- C. NUCLEUS.** *Mya Inequivalvis*. Mont. Test. Brit., vol. 1, p. 38. *C. Striata*. Flem. Brit. An., p. 425. *C. N.* Quarterly Journal of Science, vol. 14, pl. 5, fig. 38.

Montagu says, "this shell is by no means uncommon; but rarely to be obtained alive, or with connected valves; we have found it on the coasts of Cornwall and Devonshire: and in a living state dredged from Salcomb bay." I have obtained it from Gorran.

**LITHOPHAGA.**

Boring shells, without accessory pieces or sheath, and more or less gaping at the anterior side. Ligament external.

**SAXICAVA.**

**GENERIC CHARACTER:** Shell bivalve, transverse, the sides unequal; gaping interiorly at the superior margin; hinge almost without teeth.

- \* **S. RUGOSA.** *Mytilus* R. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 63, fig. 72. Mag. Nat. Hist., O. S., vol. 4, p. 358. The boring species of shell-fish found in Britain belong chiefly to the genera *Teredo*, *Pholas* and *Saxicava*; for it may be doubted whether any of the other families, though found in similar situations, are able to form for themselves the chambers they inhabit. The *Teredines* are found only in wood, which when soaked in sea-water they readily devour, so that their intestines are found greatly distended with it. The *Pholades* prefer the hard rock: either the common slate of our coast, which when young they readily penetrate, and hollow smoothly out to the depth of several inches, with a diameter equal to the comfortable expansion of the shell: or the sandstone found in the sea at no great distance. Limestone is also subject to their depredations, but it seems, less frequently; and when the chamber is become sufficiently large for their full growth, no further destruction ensues, except from the multiplication of individuals. The *Saxicava Rugosa*, though a much smaller Animal, is far more destructive, from being much more generally distributed, and in greater numbers. It has also of late attracted special attention from having spread its ravages along the whole front of the Breakwater at Plymouth; and thereby excited in the minds of some,

grinding of their singularly formed jaws. The *Saxicava Rugosa* has its projectile organ or tongue, a rough rasp-like structure which may be supposed by repeated application to be capable of wearing down the substance of the rock; but in other boring animals, some of which are naked, and perform the operation on the shells of Bivalves, for the purpose of devouring the Mollusk within, no such structure has hitherto been detected; and the *Saxicava Rugosa* itself seems indisposed or incapable to penetrate any other rock beside that of limestone. It is probable therefore, that some digestive application with chemical powers is first made use of, by which the mechanical operation of the tongue is the more easily secured. This slender organ is sometimes found protruded, occasionally in a tortuous direction, in a passage through the stone, to the length of nearly two inches, with a transverse measurement not exceeding its own breadth: a circumstance which seems to show, that the operation is as much for obtaining food, as for the purpose of enlarging its habitation.

This species of *Saxicava* preserves its membranous covering while enclosed in its rocky cave; but when, as is sometimes the case, it has become enveloped in a mass of coral, it becomes denuded, and so changed in form as scarcely to be recognized.

#### VENERIRUPIS.

**GENERIC CHARACTER:** The shell transverse, sides unequal; the posterior side very short, the anterior gaping slightly. Hinge with two teeth in the right valve, and three in the left, sometimes three in each, the teeth small, approximate, parallel, and but little or not at all divergent. Ligament external.

- \* *V. DECUSSATA.* *Venus Literata.* Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 57, fig. 53. *V. Decussata.* Mont. Test. Brit., vol. 1, p. 124. Stew. Elem., vol. 2, p. 382. *Venerupis D.* Flem. Brit. An., p. 451. Common in harbours through which a fresh stream flows. I have obtained it from Looe, so near the surface of the ground, that the muscles had fastened their byssus to it. This and the following are termed hens, to distinguish them from cocks or cockles.
- \* *V. PULLASTRA.* *Venus P.* Mont. Test. Brit., vol. 1, p. 125. *Venerupis P.* Flem. Brit. An., p. 451. This is by Sowerby constituted the type of the genus *Pullastra*. It is common, though by several Naturalists strangely overlooked or confounded with less common kinds. It burrows, in rather firm ground, a few inches beneath the surface.

\* **V. VIRGINEA.** Venus V. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 55, without a number. Stew. Elm., vol. 2, p. 382. Mont. Test. Brit., vol. 1, p. 128. Venerupis V. Flem. Brit. An., p. 452. Not uncommon in St. Austle bay; and dead shells with the valves adhering, abundant in the mud taken up in deepening Falmouth harbour. It is also one of the shells that came from the stream work, now abandoned, at Pentewan.

\* **V. PERFORANS.** Venus P. Mont. Test. Brit., vol. 1, p. 127, pl. 3, fig. 6. Flem. Brit. An., p. 451.

Montagu observes, "This species at first sight might readily be confounded with the young of the *V. Decussata*; but the slender and recurved teeth is a discriminating character, if all others were wanting. It rarely exceeds three eighths of an inch in length, and five eighths in breadth. With respect to shape it is difficult to fix any as a permanent character; it is however most frequently subrhomboidal; sometimes nearly as long as it is broad, generally straight on the front margin, but in some instances deeply sinuous or indented; not very unlike Mr. Pennant's figure of the *V. Sinuosa*. We found this species in abundance on the shore near Plymouth, burrowed in hard limestone, detached fragments of which were perforated in all directions, and stuck full of them."

From these remarks it would appear that Montagu had never seen this shell, except as imbedded in a substance that modified its character and perhaps stunted its growth. Dr. Fleming describes it as in length about an inch, breadth two inches and half. But a specimen which I have obtained, that had never been embedded in stone, answers more correctly to Montagu's figure and description, than to any other



This family is subdivided into *N. Solenaria*, and *N. Tellinaria*.

### NYMPHACEA SOLENARIA.

#### SANGUINOLARIA.

**GENERIC CHARACTER:** Shell transverse, subelliptical, slightly gaping at the lateral extremities; superior margin arched, not parallel to the lower; two approximate teeth in each valve. This genus is distinguished from the *Solens* by the superior margin not being parallel to the inferior; they also gape but little at the lateral extremities.

\* *S. VESPERTINA*. *Tellina Variabilis*. Turt. Lin. T. Depressa. Pen. Brit. Zo., vol. 4, pl. 47, fig. 27. *Solen Vespertinus*. Mont. Test. Brit., vol. 1, p. 54. *Sanguinolaria V.* Flem. Brit. An., p. 460. Found by Montagu at Falmouth; where it is scarcely uncommon.

*S. DEFLORATA*. Venus D. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 57, fig. 54. Stew. Elem., vol. 2, p. 381. Mont. Test. Brit., vol. 1, p. 123, pl. 3, fig. 4. S. D. Flem. Brit. An., p. 461.

Montagu says, "we found a perfect, recent, specimen at Falmouth, it was dredged from the harbour of that place, but is no doubt a very rare species in England."

#### PSAMMOBIA.

**GENERIC CHARACTER:** Shell transverse, elliptical or oblong oval, rather flat, slightly gaping at both sides; beaks prominent. Two cardinal teeth on the left valve, and one entering tooth on the opposite valve.

\* *P. FERROENSIS*. *Tellina Incarnata*, Pen. Brit. Zo., vol. 4, pl. 47, fig. 31. *T. Ferroensis*. Stew. Elem., vol. 2, p. 371, *T. Fervensis*. Mont. Test. Brit., vol. 1, p. 55. *P. Ferroensis*. Flem. Brit. An., p. 438. Without being rare, it seems somewhat scarce, perhaps from being easily destroyed. I have found single valves adhering to the byssus of the Pinna, from the depth of 50 fathoms; and I once took it from the stomach of the Picked Dog-fish.

\* *P. FLORIDA*. Flem. Brit. An., p. 437. In St. Austle bay, and near Falmouth. A specimen marked for me at the British Museum, *Ps. Bilineata*, not uncommon in Cornwall, seems to be of this species.

\* *P. SOLIDULA*. *Tellina Carnaria*. Pen. Brit. Zo., vol. 4, pl. 49, fig. 32. T. S. Mont. Test. Brit., vol. 1, p. 63. T. C. Stew. Elem., vol. 2, p. 373. P. S. Flem. Brit. An., p. 438. Abundant at Par.

\* *P. ROTUNDATA*. *Tellina R.* Mont. Test. Brit., vol. 1, p. 71, pl. 2, fig. 3. P. R. Flem. Brit. An., p. 438. I have found it at Par; and have obtained it from the byssus of the Pinna.



**P. COSTATULA.** Flem. Brit. An., p. 437. A single valve was supplied to me by Mr. Peach from Gorran.

**P. STRIGILLATUS.** Flem. Brit. An., p. 439. Fleming reports it from Torbay and Cornwall.

***NYMPHACEA TELLINARIA.***

THE FIRST DIVISION IS MARKED BY HAVING ONE OR TWO LATERAL TEETH.

**TELLINA.**

**GENERIC CHARACTER:** Shell transverse or orbicular, in general rather flat; the anterior side angular, with a flexuous and irregular fold on the margin. One or two cardinal teeth in the same valve; two lateral teeth, often distant.

\* **T. SQUALIDA.** Mont. Test. Brit., vol. 1, p. 56. Flem. Brit. An., p. 436. I have found it at Par.

\* **T. DONACINA.** T. Trifasciata. Pen. Brit. Zo., vol. 4, p. 88. T. D. Mont. Test. Brit., vol. 1, p. 58. Stew. Elem., vol. 2, p. 371. Flem. Brit. An., p. 435. I have obtained it from the byssus of the Pinna from deep water; and also near the land, but rarely. Montagu found it in Falmouth harbour.

\* **T. TENUIS.** T. Planata. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 48, fig. 29. Stew. Elem., vol. 2, p. 370. Mont. Test. Brit., vol. 1, p. 59. T. T. Flem. Brit. An., p. 436. It is in abundance at Par, but far less common eastward.

**T. STRIATA.** Turt. Lin. Mont. Test. Brit., vol. 1, p. 60. Flem. Brit. An., p. 436. Rare. I found two or three single valves at Par.

\* **T. CRASSA.** Turt. Lin. Pen. Brit. Zo., vol. 4 pl. 48, fig. 28. Mont. Test. Brit., vol. 1, p. 65. Flem. Brit. An.

\* *L. RADULA*. Tellina Radula. Mont. Test. Brit., vol. 1, p. 68. pl. 2, fig. 1, 2. Lucina R. Flem. Brit. An., p. 441. Montagu found it in abundance at Falmouth; and I have obtained it on the east coast.

*L. FLEXUOSA*. Tellina F. Mont. Test. Brit., vol. 1, p. 27. Lucina F. Flem. Brit. An., p. 442.

Montagu says "It is abundant in the sand of Falmouth harbour; it is less common in other districts."

*L. PISIFORMIS*. Cardium Discors, Mont. Test. Brit., vol. 1, p. 84. L. P. Flem. Brit. An., p. 442.

Montagu says "we hesitate to determine this shell to be actually English, having only found one dead specimen in sand at Falmouth, taken from the harbour."

*L. ARCUATA*. Cardium A. Mont. Test. Brit., vol. 1, p. 85, pl. 3, fig. 2. Lucina A. Flem. Brit. An., p. 442.

"We found this elegant species in Falmouth harbour, dredged, up with sand for manure; but not common." Montagu.

*L. LACTEA*. Telina L. Lin. Mont. Test. Brit., vol. 1, p. 10, pl. 2, fig. 4. Loripes Lacteus. Flem. Brit. An., p. 430. Scarcely uncommon.

#### DONAX.

**GENERIC CHARACTER:** Shell transverse, equal valved, unequal sided; anterior side very short and obtuse. Two cardinal teeth either in both valves, or only in one; one or two lateral teeth, more or less distant. Ligament short, external, inserted in the place occupied by the lunula.

This genus is characterized by its rather flattened, and almost triangular shell, and by having at the hinge, beside the cardinal teeth, one or two rather distant lateral teeth, separated from the cardinal teeth, and analogous to the lateral teeth of the Mactræ, Succinæ and Tellinæ. The ligament of the Donaces and Tellinæ, is always on the shortest side of the shell, but in the Veneres and Cytheræ, it is on the longest. The Donax has not the flexuous fold of the Tellina. Journal of Science, vol. 14, p. 307.

\* *D. TRUNCULUS*. Turt. Lin. Pen. Br. Zo., vol. 4, pl. 55, fig. 45. Mont. Test. Brit., vol. 1, p. 103. Flem. Brit. An., p. 433. On some part of the coast this is rare; but it is found at Par in abundance.

*D. DENTICULATA*. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 55, fig. 46. Mont. Test. Brit., vol. 1, p. 104. Stew. Elem., vol. 2, p. 378. Flem. Br. An., p. 433. This is inserted on the authority of Da Costa; neither Montagu nor myself having ever found a specimen.

\* *D. COMPLANATA*. Mont. Test. Brit., vol. 1, p. 106. Flem. Brit. An., p. 434. Rare. Montagu found it at Falmouth and Looe; and among a collection of small shells

which a child procured for me on the beach at Par, I found five specimens of the single valves.

**D. RUBRA.** Flem. Brit. An., p. 434. I have only obtained a single valve of this rare species.

THE SECOND DIVISION IS MARKED BY HAVING NO LATERAL TEETH.

#### CAPSA.

**GENERIC CHARACTER:** The Shell transverse, equal-valved, close; the hinge with two teeth in the right valve, and one entering bifid tooth in the other; no lateral teeth. Ligament external.

**C. CASTANEA.** Donax C. Mont. Test. Brit. vol. 2, p. 573. C. C. Flem. Brit. An. p. 434.

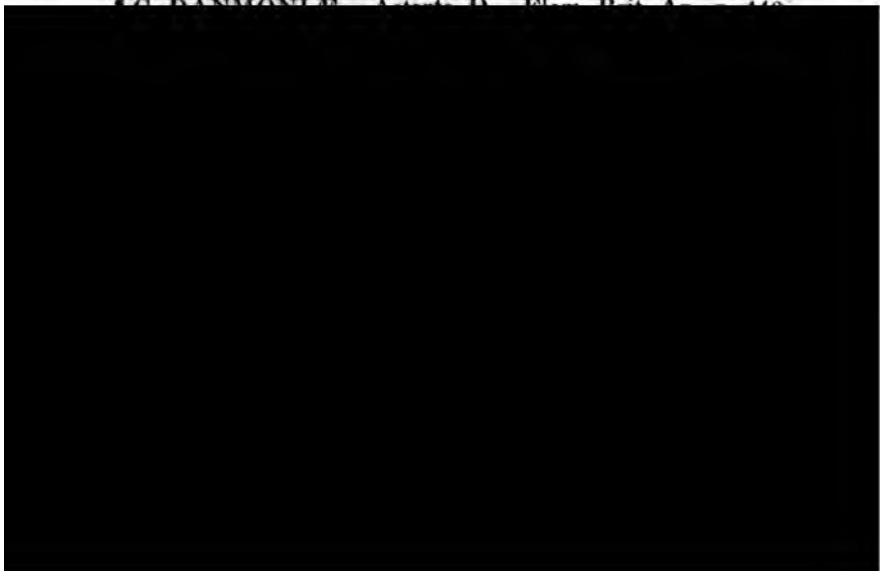
Montagu observes, "It appears to be a rare species, as only one mutilated specimen of a single valve had come under observation till very lately, which was taken at Falmouth in Cornwall, five or six years ago; from which we did not choose to hazard a description: a few other specimens, recently found at St. Austle bay in that county, and on the coast of Devon, has enabled us to add it to the Catalogue of British Shells."

#### CRASSINA.

**GENERIC CHARACTER:** The shell suborbicular, equal-valved, with scarcely equal sides, close. Two strong diverging cardinal teeth in the right valve, and two very unequal teeth on the other. Ligament on the longest side external.

\* **C. SULCATA.** Venus S. Mont. Test. Brit., vol. 1, p. 131. Astarte S. Flem. Brit. An., p. 439. It is introduced on the authority of Da Costa.

\* **C. RANUNCULUS.** Astarte S. Flem. Brit. An., p. 439.



The Conchæ are divided into Fluviatiles and Marinæ.

### CONCHÆ FLUVIATILES.

The shells covered with a false epidermis, and having two lateral teeth near the hinge.

#### CYCLAS.

**GENERIC CHARACTER:** Shell ovate, globose, transverse; equalvalved, the beaks tumid; cardinal teeth very small, sometimes scarcely perceptible; occasionally two in each valve, one of them plaited in two; sometimes only one plaited or lobed tooth in one valve, and two in the other; lateral teeth transversely elongated, compressed, lamellar. Ligament external. Mr. Gray's character of his Cycladæ is, the shell subcordate, porcellaneous, thin, covered with a hard, olive, horny periostraca; hinge teeth two or three, diverging; lateral teeth distinct, laminar.

C. CORNEA. Tellina Cornea. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 49, fig. 33. Cardium C. Mont. Test. Brit., vol. 1, p. 86. C. C. Flem. Brit. An., p. 452. Gray's Turton's Manual of land and fresh water shells, p. 280, pl. 1, fig. 2. There are few situations in Cornwall, in which the Cycladæ can find a proper habitation; and hence the present species is in a great measure local. I have obtained it, by favour of a Lady, from near Helston.

#### PISIDIUM.

**GENERIC CHARACTER:** The shell suboval, wedge-shaped, unequal sided; the teeth as in Cyclas.

P. AMNICUM. Cardium A. Mont. Test. Brit., vol. 1, p. 86. Cyclas A. Flem. Brit. An., p. 453. P. A. Gray's Turt., p. 285, pl. 1, fig. 5. In the Swanpool, near Falmouth.

### CONCHÆ MARINÆ.

Generally with no lateral teeth: sometimes the whole shell, except the beaks, covered with epidermis.

#### CYPRINA.

**GENERIC CHARACTER:** The valves equal, the shell obliquely heartshaped, the beaks obliquely curved. Three unequal cardinal teeth, approaching at their base, slightly diverging above. One lateral tooth, distant from the hinge, on the anterior side, sometimes obsolete. Callosities of the Nymphæ large, arched, ending near the beaks by a pit. Ligament external, partly sunk under the beaks.

By having an epidermis, and their sometimes almost obsolete lateral tooth, the Cyprinæ are somewhat allied to the fresh water Conchæ.

\* C. ISLANDICA. Venus I. Turt. Lin. V. Mercenaria Pen. Brit. Zo., vol. 4, pl. 53, fig. 47. V. I. Mont. Test.

Brit., vol. 1, p. 114. C. I. Flem. Brit. An., p. 443. Scarcely abundant; but taken in Trawls and on the lines of fishermen.

C. MINIMA. Venus M. Mont. Test. Brit., vol. 1, p. 121 pl. 3, fig. 5. C. M. Flem. Brit. An., p. 444.

Montagu says, "It is a rare species, which we have only found sparingly at Falmonth, dredged from the harbour, alive."

#### CYTHERÆA.

**GENERIC CHARACTER:** The valves equal, the shell suborbicular, triangular or transverse, four cardinal teeth on the right valve, three of them diverging, approaching at their base, and one, perfectly insulated, situated near the lunula. Three diverging cardinal teeth on the other valve, with a rather distant oval pit, parallel to the margin. No lateral teeth.

\* C. CHIONE. Venus C. Turt. Lin. Mont. Test. Brit., vol. 1, p. 115. Flem. Brit. An., p. 144. *Queens*. Common.

C. OVATA. Venus Ovata. Pen. Brit. Zo., vol. 4, pl. 56, fig. 56. Flem. Brit. An., p. 445. Dead shells common.

C. REFLEXA. Venus R. Flem. Brit. An., p. 446. Rare. I possess a single valve, obtained from the byssus of a Pinna from deep water.

I have classed this species in the genus *Cytheræa*, from the circumstance that my specimen was thus marked, by a gentlemen well acquainted with conchology. In many instances, indeed, the distinctions of these genera cannot be strictly preserved; and therefore I venture to place here a species, with which, without close investigation, it may be confounded. This is the *Venus Prideauxiana*, as marked by the same kind friend. The description of *C. Reflexa* is:



the circular margin of the shell, but less finely and regularly than the former.

Of this shell also, I have seen but a single valve, obtained from the byssus of a Pinna from deep water.

#### VENUS.

**GENERIC CHARACTER:** The shell with the valves equal, sides unequal, transverse or suborbicular. Three approximate cardinal teeth in each valve; the lateral teeth diverging at the summit, ligament external, covering the scutcheon.

**V. CASSINA.** V. Erycina, variety. Pen. Brit. Zo., vol. 4, pl. 54, fig. 48. V. C. Flem. Brit. An., p. 446. Not common.

\* **V. VERRUCOSA.** Turt. Lin. V. Erycina. Pen. Brit. Zo., vol. 4, pl. 54, fig. 48. V. V. Mont. Test. Brit., vol. 1, p. 112. Borlase's Nat. Hist. Corn. pl. 27, fig. 32. Flem. Brit. An., p. 446. Common on the shores east of the Lizard, and abundant in the soil dredged from Falmouth harbour.

\* **V. FASCIATA.** V. Paphia. Turt. Lin. Mont. Test. Brit., vol. 1, p. 110. V. F. Flem. Brit. An., p. 447. Common. It frequently creeps into crabpots in search of the bait.

\* **V. GALLINA.** Turt. Lin. V. Striatula. Mont. Test. Brit., vol. 1, p. 113. V. G. Flem. Brit. An., p. 448. Common; and with the same habits as the last.

**V. SUBCORDATA.** Mont. Test. Brit., vol. 1, p. 121, pl. 3, fig. 1. Flem. Brit. An., p. 447. Found by Montagu in sand from Falmouth harbour.

**V. GRANULATA.** Turt. Lin. Mont. Test. Brit., vol. 1, p. 122. Flem. Brit. An., p. 447. Scarce; found by Montagu at Falmouth.

**V. UNDATA.** Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 55, fig. 51. Mont. Test. Brit., vol. 1, p. 117. Flem. Brit. An., p. 448. Not common. Montagu found it at Falmouth.

\* **V. AUREA.** Turt. Lin. Mont. Test. Brit., vol. 1, p. 129. Flem. Brit. An., p. 449. This shell seems to be locally common. Montagu found it in sand from Falmouth harbour; from whence also I have obtained it, and from St. Austle bay.

#### CARDIACEA.

Cardinal teeth irregular, either in form or situation, and generally accompanied by one or two lateral teeth.

#### CARDIUM.

**GENERIC CHARACTER:** Shell with equal valves, somewhat heart shaped; beaks prominent; internal margin of

the valves toothed or plaited. Hinge with four teeth on each valve: the two cardinal approximate and oblique, articulating crosswise with the corresponding teeth of the other valve; the two lateral teeth distant, entering. The ligament is external and very short; and there are two faint muscular impressions.

- \* **C. EDULE.** Turt. Lin. Pen. Brit. Zo., pl. 50, fig. 41. Mont. Test. Brit., vol. 1, p. 76. Flem. Brit. An., p. 422. *Common Cockle.* Common in harbours that have a stream of fresh water; from whence they are taken in abundance, and carried to market.

This shell varies so considerably, as almost to raise the suspicion of a difference of species. In its younger state it is about equal-sided, the ridges smooth; but when fully grown in an undisturbed situation, the hinge is nearer one end, the opposite margin produced, and the ridges thickly and regularly covered with raised transverse edges. A considerable quantity in this state, of large size, and mixed with *Venerirupis Decussata*, *V. Virginea* and others, were found with other ancient animal remains, in the stream work of Lower Pentewan, near St. Austle.

- \* **C. ECHINATUM.** Turt. Lin. Mont. Test. Brit., vol. 1, p. 78. Flem. Brit. An., p. 420. *Prickly Cockle.* Not uncommonly taken in the Trawl.
- \* **C. TUBERCULATUM.** Mont. Test. Brit., vol. 1, p. 79, and vol. 2, p. 568. Flem. Brit. An., p. 421. The loose valves are scattered along our shores; and in some places in abundance, as in Lantivet bay, east of Fowey.
- C. CILIARE.** Turt. Lin. Mont. Test. Brit., vol. 1, p. 80. Fleming supposes this to be the young state of *C. Aculeatum*. Pen. Brit. Zo., vol. 4, pl. 50, fig. 39. Mont.

glossy; margin strongly denticulated. We found this new species amongst sand from Falmouth harbour. Diameter three quarters of an inch. Although this shell bears some resemblance to the young *Echinatum*, it must not be confounded; the young of that species is always more globose or convex; the ribs are more sharp, and the tubercles more pointed and distant." Montagu. Dr. Fleming is disposed to regard it as the young of *C. Muricatum*.

- *C. LÆVIGATUM*. Pen. Br. Zo., vol. 4, pl. 51, fig. 40. Mont. Test. Brit., vol. 1, p. 88. Flem. Brit. An., p. 423. On some parts of our coast, and especially at Hannafore, apposite Looe Island, I find single valves thrown on shore in abundance.

*C. FASCIATUM*. Flem. Brit. An., p. 422. British Museum. Obtained from near the Land's end.

#### HIATELLA.

**GENERIC CHARACTER:** Shell with the valves equal, the sides unequal, transverse, gaping at the anterior margin. Hinge with one small tooth on the right valve, and two rather larger, on the left. Ligament external.

- *H. ARCTICA*. Solen Minutus. Turt. Lin. Mont. Test. Brit., vol. 1, p. 53, pl. 1, fig. 4. H. A. Flem. Brit. An., p. 461. Crouch's Intro. to Lam., pl. 8, fig. 6. Not uncommon, burrowed in stone.

*H. PRÆCISA*. Mytilus P. Mont. Test. Brit., vol. 1, p. 165, pl. 4, fig. 2. Great confusion exists in the writings of naturalists, concerning the two species of *Hiatella* here given, and *Saxicava Rugosa*; some supposing them to be no more than one species, while by others they are separated into different Genera. Under these circumstances, and having examined them when apparently uninfluenced by foreign bodies, I have judged it best to follow the opinion of Montagu, who considers them distinct. *H. Præcisa* is common on rocks near low water mark, attached to the roots of corallines by the aid of a byssus.

#### ISOCARDIA.

**GENERIC CHARACTER:** The shell heartshaped, transverse, gaping at the upper margin, the valves equal, the beaks distant, diverging, spirally turned on one side; two flat, entering, cardinal teeth, one of them curved and sunk under the beak; one elongated lateral tooth, situated under the corselet. Ligament external, forked on one side.

- I. COR*. Chama Cor. Turt. Lin. Mont. Test. Brit. vol. 1, p. 134. I. C. Flem. Brit. An. p. 418. Crouch's Intro. pl. 8, fig. 7. Very rare. I have seen a specimen which,



I was assured, was taken near Falmouth, and am informed that it is not uncommon at Helford, buried at some depth in the sand.

### ARCACEA.

Cardinal teeth small, numerous, entering, and disposed on each valve in a straight, arched or broken line.

### ARCA.

**GENERIC CHARACTER:** Shell transverse, the valves nearly equal, sides unequal, beaks distant, separated by the facet of the ligament. Hinge linear, straight, without ribs at its extremities, and furnished with a series of many entering teeth. Ligament wholly external.

\* **A. NOÆ.** Turt. Lin. Borlase's Nat. Hist. Corn., pl. 28, fig. 16. **A. Tortuosa.** Pen. Brit. Zo., vol. 4, p. 97. **A. N.** Mont. Test. Brit., vol. 1, p. 139, pl. 4, fig. 3. **Flem. Brit. An.,** p. 397. Scarce. I have obtained it from Pridmouth, near Fowey; and about the Land's end, chiefly from cavities in stones from deep water.

**A. LACTEA.** Turt. Lin. **A. Barbata.** Pen. Brit. Zo., vol. 4, pl. 58, fig. 59. But the reference misplaced to **A. Nucleus.** **A. L.** Mont. Test. Brit., vol. 1, p. 138. **Flem. Brit. An.,** p. 398.

"This shell" says Montagu, "is found in great abundance in some parts of the south coast of Devon; and not frequently on that of Cornwall; particularly about Falmouth; but live shells, or double valves with the epidermis on, are rare." It is scarce on other parts of the coast.

\* **A. FUSCA.** **Flem. Brit. An.,** p. 397; who quotes Borlase's Nat. Hist. Corn., pl. 28, fig. 15; and Montagu's supplement. Not uncommon in the crevices of stones from deep water.

**A. RHOMBEA.** Marked for me by J. E. Gray, Esq. of the British museum. It is the largest of the British *arca* that has come under my notice, measuring in its longest diameter one inch and four-tenths, and in breadth nine-tenths of an inch, figure of the rhomb across the hinge one inch and one-tenth; surface of the valves as if worn, by the friction of opening in the cavity of the stone in which it was included, and hence the vestiges of striae were but few. About the middle of the free edges of the valves is a vacancy rounded off into a long oval; this portion, when the valves are closed being filled by a semicalcareous operculum formed on the summit of the tongue or protrusive organ. A border, of regular form and about one-tenth of an inch wide, circles the free margin of the valves, being covered with short bristles in narrow lines. Some marks of these hairs appear on other parts, especially on the terminal angle of the opening. Colour dull yellow, bristles brown.

This, the only specimen which I have met with, was found in a cavity originally formed by a *Pholas* in sandstone from deep water, and was for some time alive in my possession.

#### PECTUNCULUS.

**GENERIC CHARACTER:** Shell orbicular, almost lenticular, the valves equal, sides almost equal, close. Hinge arched, with a series of many, oblique entering teeth, the middle ones obsolete, nearly obliterated. Ligament external. This genus is distinguished from *arca* by its orbicular form, and by the hinge being arched instead of straight. The teeth also are less numerous, more separate and larger; and they never gape. The beaks are not very distant, yet are always separated by an external, narrow, angularly furrowed, rather hollow facet, to which the ligament is attached, and which distinguishes the *Pectunculi* from the genus *Nucula*; the ligament of which is partly interior, and which has no facet between the beaks.

\* **P. PILOSUS.** *Arca P.* Turt. Lin. *A. Glycimeris.* Pen. Brit. Zo., vol. 4, pl. 58. fig. 58. *A. P.* Mont. Test. Brit., vol. 1, p. 136. *P. P.* Flem. Brit. An., p. 400. Common, and locally abundant.

#### NUCULA.

**GENERIC CHARACTER:** The shell transverse, triangularly ovate or oblong, the valves equal, sides unequal; no facet between the beaks; hinge linear, broken, many toothed, interrupted in the middle by an obliquely extending spoonshaped pit; the teeth numerous, often produced as in the *Pectens*; the beaks contiguous, curved backwards. Ligament marginal, and partly internal, inserted in the pit or spoon of the hinge.

- **N. NUCLEA.** Arca N. Mont. Test. Brit., vol. 1, p. 141.  
N. N. Flem. Brit. An., p. 401. Not uncommon.

#### **NAIADA.**

Fresh Water Shells; the hinge with an irregular, simple or divided cardinal tooth, and a longitudinal one, which extends under the corselet; sometimes no tooth; or with irregular granular tubercles through its length. Muscular impression posterior, compound; the beaks decorticated or eroded.

#### **UNIO.**

**GENERIC CHARACTER:** The shell transverse, with equal valves, unequal sides, free; beaks decorticate, almost eroded; muscular impression posterior, compound; hinge with two teeth in each valve; one cardinal, short, irregular, simple, or divided into two substriated; the other elongated, compressed, lateral, prolonged under the corselet. Ligament external.

- **U. MARGARITIFERA.** Mya M. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 43, fig. 18. Mont. Test. Brit., vol. 1, p. 33. Alasmodon M. Flem. Brit. An., p. 417. Gray's Turt., p. 293, pl. 2, fig. 9. *River Muscle*. In some of our larger rivers, as the Camel and Tamar.

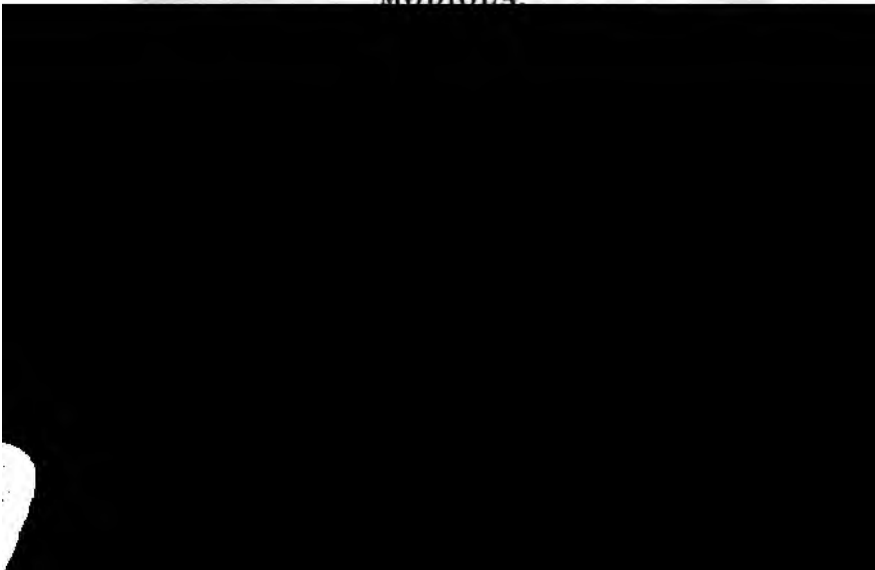
#### **CONCHIFERA UNIMUSCULOSA.**

With one muscular impression, nearly in the middle of the interior.

#### **MYTILACEA.**

The Ligament at the hinge subinternal, marginal, linear, very entire, occupying a great part of the anterior margin; rarely foliated.

#### **MODIOLA.**



had not been disturbed when brought to me. There was no byssus. The same species is sometimes found on the shore.

- \* **M. DISCREPANS.** *Mytilus* D. Mont. Test. Brit., vol. 1, p. 169. *Modiola* D. Flem. Brit. An., p. 413. Abundant on rocks, attached by a byssus to the stems of the common Coralline. It is also frequently found embedded in the substance of a species of ascidia: in a manner not easily to be accounted for, but in which situation it grows to a much larger size than when openly exposed, and with much more beautiful colours. When thus enclosed, the syphon pierces the tunic of the animal, and thus preserves its communication with the water.

**M. DISCORS.** *Mytilus* D. Mont. Test. Brit., vol. 1, p. 167. *Modiola* D. Flem. Brit. An., p. 413. Common, but less abundant than the last species; I have never found it buried under the tunic of an *Ascidia*, like the last named species.

**M. GIBBSII.** Flem. Brit. An., p. 413. Of this rare species I have seen only one specimen, presented by a Lady.

**M. BARBATUS.** *Mytilus* Curtus. Turt. Lin. Pen. Brit. Zo. vol. 4, pl. 64, fig. 76. M. B. Mont. Test. Brit., vol. 1, p. 161.

Dr. Fleming confidently pronounces this to be a variety of *Modiolus Vulgaris*; with which opinion neither Montagu's nor mine can agree. It is not rare; but whether the following is a younger growth or separate species, must be left for further research. It is provisionally named, for it differs considerably from a foreign shell marked *M. Barbatus* in the museum of the Royal Institution; and I have found the Cornish shells so named, so commonly fixed amongst specimens of *Mytilus Incurvatus*, a shell which from its exposed situation soon becomes naked and worn, that I have doubted whether it be not the young of that species; an opinion which seems to have been held by Pennant.

- \* **M. MINUTUS.** It is minute; and many specimens were found among a multitude of the *Kellia rubra*, studding the fibres of a small green sea weed, on which they appear to have been feeding. It is about as deep as long, and along the side of the hinge thinly studded with short firm hairs. It is not attached by a byssus, and seems capable of motion, like the *Kellia*.

#### MYTILUS.

**GENERIC CHARACTER:** Shell longitudinal, the valves equal, regular, pointed at the base, fixed by a byssus. Beaks almost strait, terminal, pointed. Hinge lateral, usually without teeth. Ligament marginal, subinternal. One elongated, clavate, sublateral muscular impression.

- **M. EDULIS.** Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 63, fig. 33. Mont. Test. Brit., vol. 1, p. 159. Flem. Brit. An., p. 411. *Common Muscle.* Naturalists have not yet agreed whether we have one or several species of Muscle; it is therefore judged best to speak of the several varieties found on our coast, as if they were species, by which means we shall avoid the great, though least common error, of confounding together several separate kinds: a minute examination of the animal of which will alone decide the question of their specific identity.

Dr. Fleming's character of this species refers to the *M. Pellucidus* of Pennant, pl. 63, fig. 75; a variety of common occurrence—rather than to the more usual appearance of this shell-fish, which is without longitudinal coloured bands. Beds of muscles are found in harbours and the mouths of rivers, where from the frequent change of salt and fresh water, they attain their highest perfection; and from whence they are taken for food, and to be used as bait by fishermen. There is no shell-fish that so frequently disagrees with the stomach, as the muscle; and the symptoms it produces are often of the most violent kind.

- M. SUBSAXATILIS.** Williamson in Mag. Nat. Hist. O. S. vol. 7, p. 354. The difference between this, and the long and narrow form of a variety that is of frequent occurrence at Helford, and some other parts of our coasts, would indicate specific distinction: but the more common form intermediate between them, is united to either by such gradual marks of approach, that nothing beyond doubt can be admitted,

- **M. INCURVATUS.** Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 64, fig. 74. As this species assumes much variety of

vol. 1, p. 180. Flem. Brit. An., p. 406. It is called by fishermen *Cappa Longa*, from its resemblance to the Razor shell, the larger *Solen*; which formerly bore that name, as Lister informs us it also did at Venice.

The synonyms of the British *Pinnæ* have become so confused, that to prevent further mistake it is judged necessary to give minuter descriptions of them, than of the other species of shells described or referred to in this work. The Greater *Pinna*, in the specimen selected, is in length on the side of the hinge, 12 inches; but the longest in my collection measures 17 inches. Length of the specimen on the wider end, 13 inches: from the point to the remotest distance  $14\frac{3}{4}$  inches; greatest girth  $16\frac{3}{4}$  inches: form of the outline, somewhat that of a scimitar or cleaver. The longitudinal striae are well marked, but irregular, and more commonly without concave spines. Colour light brown, dark near the pointed end, this colour passing upward in broad stripes, I have not had an opportunity of comparing this shell with that from the Mediterranean, which bears the same name; but the byssus of the latter is very different, being far more soft, silky, and in colour a rich yellowish brown, whereas that of our coast is rigid and of an intense black.

Montagu's account of this species is as follows: "We discovered a bed of these shells in Salcomb bay, in Devonshire; where they are called by the fishermen French muscles, or scallops. They lie on a gravelly bottom covered with mud and long sea-weeds; and are only to be got at particular times, when the sea recedes farther than usual. They stand upright, with the large end about an inch above the surface; the lower end fixed by a very large strong byssus, so firmly attached to the gravel, that much force is required to draw them up; and most commonly the byssus is left behind. This beard is composed of numerous, fine, silk like fibres, of a dark purplish brown, two or three inches in length. The larger end of the shell is naturally a little open, and cannot be closed by art, but the animal is capable of effecting it, the beaks of the valves rarely cover each other exactly. The bank on which these shells are found, probably increases, so that the water leaves a greater part bare, at every spring tide, than formerly." This species is also reported as an inhabitant of Falmouth harbour; but it is found in the greatest abundance, at the distance of from three to six or eight leagues south of the Deadman point; where they stud the bottom in multitudes, with only two or three inches of the pointed end inserted into the soil. It is common for the line or hook to become entangled among these shells, and powerful effort is required to drag them from their attachment; which is only effected by breaking the byssus, or tearing away the ground to which it is attached.

In the latter case a rich harvest of shells is often afforded ; but the pointed end of the pinna is usually broken off by the violence. It is perhaps owing to the different degree of solidity in the ground, that the shells living in the deeper water, are so much less buried, than those of which Montagu speaks ; and one of the consequences may be a greater freedom of motion in the shell. Montagu observes, that the exposed end cannot be closed by art, but the animal is capable of effecting it ; and observation has taught me that this is its method of obtaining food. In its ordinary position this opening is about two inches wide, exposing the contained animal, which occupies but a small portion of the cavity, and seems to offer itself as a prey to the first creature that may choose to devour it. Some fish is thus tempted to enter, but the first touch within is a signal for its destruction. The shell closes, not only at the side but top, the latter action being effected by the separation of the pointed ends ; and the captive is either crushed to death or soon perishes from confinement. It was formerly believed that the *Pinnotheres Pisum*, a Parasitic Crab, had its residence within the shell of the pinna, and was the friend to whose intimation the pinna owed the knowledge of the presence of its prey. But of the many pinnæ I have had an opportunity of examining, I have never found one containing this crab ; and Montagu has made the same remark. In one instance three or four pearls, perfectly round and of an intense black colour, were found in the mantle near the hinge.

\* *P. ROTUNDATA*. Turt. Lin., vol. 4, p. 302. This species, not hitherto recognised as British, differs from the last in form and texture : being more thin and brittle. The free margin is less circular or cleaver shaped, the

## AVICULA.

**GENERIC CHARACTER:** Shell unequal valved, brittle, rather smooth; base transverse, straight; the extremities produced, the anterior like a tail; a sinus in the left valve; hinge linear, one toothed; a cardinal tooth in each valve under the beaks. Facet of the ligament marginal, narrow, channelled, not traversed by the byssus.

**AVICULA HIRUNDO.** Flem. Brit. An., p. 405. A specimen of this rare shell, taken in Plymouth sound, is in the possession of Dr. Edward Moore.

## PECTINIDA.

The ligament internal, or partly so. Shell in general regular, compact, not foliated.

## LIMA.

**GENERIC CHARACTER:** The shell longitudinal, the valves nearly equal, eared, gaping slightly on one side between them; beaks distant, their internal facet inclined outwards; hinge without teeth. The cardinal pit partly external, receiving the ligament.

**L. FRAGILIS.** Flem. Brit. An., p. 388. It approaches to, but does not strictly correspond with the figure and description of Mr. Forbes, in the Mag. Nat. Hist., vol. 8, p. 594, fig. 65. Length one inch and three-tenths, breadth nine-tenths of an inch. The valves equal, oblique, inflated, thin but not brittle, scarcely marked with lines of growth, and with obscure, not pectinated longitudinal striæ; gaping at both sides, touching only at the ears, and extremity of the margin. Colour pale yellow. I obtained a single specimen from the trawl at Falmouth.

## PECTEN.

**GENERIC CHARACTER:** The shell free, regular, the valves unequal, with ears; the lower margin transverse, straight; beaks contiguous; hinge without teeth; a cardinal triangular pit, wholly internal receiving the ligament.

\* **P. MAXIMUS.** Ostrea M. Turt. Lin. Pecten M. Pen. Brit. Zo., vol. 4, pl. 59, a view of the under valve; Mont. Test. Brit., vol. 1, p. 143. Flem. Brit. An., p. 383. *Scallop*. Common in moderately deep water.

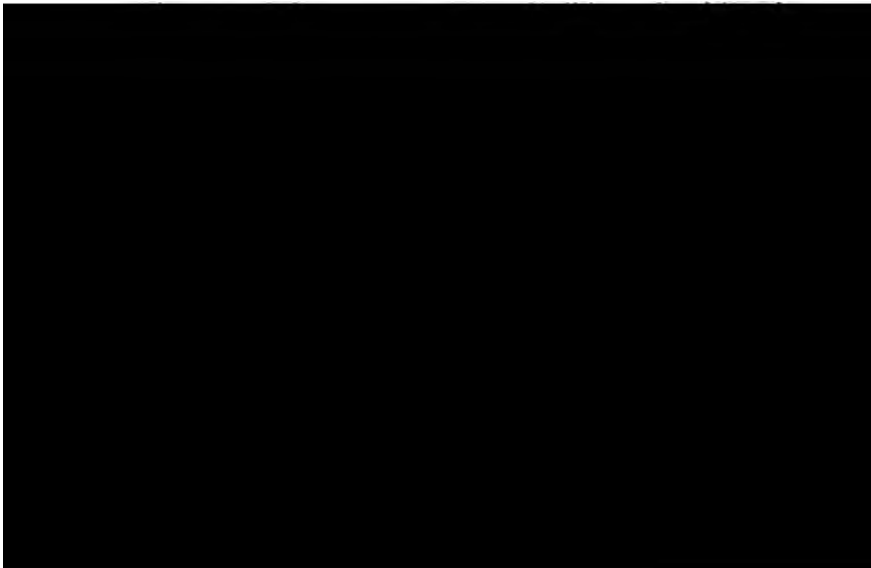
**P. JACOBÆUS.** Ostrea J. Turt. Lin. Pecten J. Pen. Brit. Zo., vol. 4, pl. 60, fig. 62. Mont. Test. Brit., vol. 1, p. 144. Flem. Brit. An., p. 388. Scarcely common.

\* **P. OPERCULARIS.** Ostrea O. Turt. Lin. Pecten Subrufus. Pen. Brit. Zo., vol. 4, pl. 60, fig. 63. P. Opercularis. Mont. Test. Brit., vol. 1, p. 145. Flem. Brit. An., p. 383. Taken abundantly in trawls, and carried to market.



- **P. VARIUS.** Ostrea V. Turt. Lin. Pecten V. Pen. Brit. Zo., vol. 4, pl. 61, fig. 64. Mont. Test. Brit., vol. 1, p. 146. Flem. Brit. An., p. 384. Less abundant.
- P. LINEATUS.** Mont. Test. Brit., vol. 1, p. 147. Flem. Brit. An., p. 383. Scarcely common. I have only seen it at Falmouth.
- P. OBSOLETUS.** Ostrea O. Turt. Lin. Pecten O. Pen. Brit. Zo., vol. 4, pl. 61, fig. 66. Flem. Brit. An., p. 385. Rare.
- **P. LEVIS.** Ostrea L. Pecten L. Pen. Br. Zo., vol. 4, 102. Mont. Test. Brit., vol. 1, p. 150, pl. 4, fig. 4. This very pretty shell is not uncommon; but is subject to great variety of colour, though always beautiful.
- **P. SINUOSUS.** P. Pusio. Pen. Brit. Zo., vol. 4, pl. 61, fig. 65. P. Distortus. Mont. Test. Brit. vol. 1, p. 143. P. S. Flem. Brit. An., p. 384. By Sowerby constituted the type of the Genus Hinnites. Common, attached by the lower valve to rocks, or more frequently to eschara foliacea. It is subject to apparent distortion in its growth; but it acquires the length of about a quarter of an inch before the irregularities begin, and afterwards becomes waved without regard to the evenness of its situation. It may be known at any stage by the ribs dividing in their progress, into smaller striæ, of nearly alternate sizes.
- P. TUMIDUS.** Flem. Brit. An., p. 314, described from Dr. Turton. Not uncommon on the shell of the pinna, but overlooked from its minute size. In their young state the Pectens are moored to their situation by a byssus; but when loosened by accident or nature, it is not renewed, and they are capable of some degree of motion,

**OSTRACEA.**



## ANOMIA.

**GENERIC CHARACTER:** Valves of the shell unequal, irregular, operculated, adhering by the operculum; smaller valve perforated, usually flat, having a hole close to the beak; the other valve larger, concave, entire. Operculum small, elliptical, bony, connected with the internal muscle, and fixed to solid bodies.

Properly speaking, the perforated valve is to be regarded as the lower one. And beside the muscular attachment of the animal to the operculum (which is only the thickened extremity of the tendon) the two valves are connected by an inner cardinal ligament.

\* **A. EPHIPPIUM.** Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 62. Mont. Test. Brit., vol. 1, p. 155. Flem. Brit. An., p. 395. Common. The largest specimens I have seen were from Pinnae, in deep water.

\* **A. CEPÆ.** Flem. Brit. An., p. 395. This well marked species seems to have been overlooked or confounded with others; from which it may be distinguished by its size, which is from one and half to two inches in length, by its undulated form, and by its colour; being of a pale red, and yellow, in broad, faint, irregular stripes: much resembling an outer layer of the coats of an onion; whence the name. It is not uncommon, on rocks or the carapace of Crustaceans.

\* **A. SQUAMULA.** Turt. Lin. Pen. Brit. Zo., vol. 4, p. 109. Mont. Test. Brit., vol. 1, p. 156. Flem. Brit. An., p. 324. Common, attached to every kind of substance. Montagu was inclined to suppose that this might be the same as the two last named species in their early state (vol. 2, p. 581), founding his remark chiefly on the difficulty of distinguishing them, and indeed the remaining kinds, when young. It must be admitted that at this stage the distinction is not always easy; but their appearance is very different when fully grown.

\* **A. UNDULATA.** Mont. Test. Brit., vol. 1, p. 156, pl. 4, fig. 6. Flem. Brit. An., p. 395:—who supposes Ostrea Striata of Montagu to be the same species. Common, though scarcely abundant.

\* **A. ACULEATA.** Turt. Lin. Mont. Test. Brit., vol. 1, p. 157, pl. 4, fig. 5. Attached to sea-weeds.

\* **A. PUNCTATA.** Flem. Brit. An., p. 395. Common.

\* **A. CYLINDRICA.** Flem. Brit. An., p. 395. Common.

**A. INFLATA.** Nobis. This, which I suppose to be undescribed, is a minute species, the diameter of the disk being about the tenth of an inch. The form is circular, the valves smooth and regular; but it is especially characterized by the elevation of its centre; which is almost

as high as the diameter of the valve. From this the beak is bent down, and small. The specimen described, which was attached to the shell of a pinna, has the summit inflated and round; but a specimen which I found in Mount's bay attached to sea-weed, was about equally elevated but pointed. Further research will decide whether these specimens belong to the same species. In another specimen, found with the former in Mount's bay, the beak approached but did not join the margin; and the upper valve was characterized by a number of well marked circular raised ribs.

#### **BRACHIOPODA.**

The shell bivalve, adhering either directly or by a tendinous cord.

#### **TEREBRATULA.**

**GENERIC CHARACTER:** Shell with valves unequal, regular, subtriangular, attached to bodies by a short tendinous pedicle; beak of the larger valve produced, often curved, perforated at the summit; hinge with two teeth; two nearly bony, slender, elevated, forked, variously branched processes rise from the disk of the small valve, and support the animal.

I found the toothed valve of what I believe a species of this genus, at Par: but the precise species is uncertain.

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#### **CLASS IV.**

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#### **MOLLUSCA.**

The body sometimes naked, either destitute of any solid

at the edges and forming a dorsal covering; the mantle by which they are kept together, allowing of motion, and forming a border round the whole.

- \* **C. FASCICULARIS.** Turt. Lin. Mont. Test. Brit., vol. 1, p. 5. Flem. Brit. An., p. 288. Not uncommon, sheltered under stones, or at the roots of the smaller sea-weeds and Corallines. When separate from its resting place, in rolls itself up into a ball; as is the habit also of the other Chitons.
- C. CRINITUS.** Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 36, fig. 1. Mont. Test. Brit., vol. 1, p. 4. Scarce; but I have found it at Coomb in Lantivet bay, among the roots of sea-weeds.
- \* **C. MARGINATUS.** Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 36, fig. 2. Mont. Test. Brit., vol. 1, p. 1. Flem. Brit. An., p. 289. Not uncommon.
- \* **C. RUBER.** C. Levis. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 36, fig. 3. Mont. Test. Brit., vol. 1, p. 2. C. R. Flem. Brit. An., p. 289. It is to be observed, that these animals are subject to variation of colour; so that scarcely two specimens of any of the species will be found exactly similar in this respect.
- \* **C. CINEREUS.** Turt. Lin. Mont. Test. Brit., vol. 1, p. 3. Flem. Brit. An., p. 289. Not uncommon.
- \* **C. ALBUS.** Turt. Lin. Mont. Test. Brit., vol. 1, p. 4. Flem. Brit. An., p. 290. Common, on shells or stones from deep water.

#### PATELLA.

**GENERIC CHARACTER:** Shell univalve, flattened conical or like a shield, concave and simple below, without fissure on the margin; the summit entire, inclining forward.

- \* **P. VULGATA.** Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 89, fig. 145. Mont. Test. Brit., vol. 2, p. 475. Flem. Brit. An. p. 286. *Limpet.* Abundant, most so on the east side of the county. They are employed to feed Ducks.
- \* **P. DEPRESSA.** Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 89, fig. 146. Mont. Test. Brit., vol. 2, p. 475. Borlase's Nat. Hist. of Corn., pl. 28, fig. 3. It remains uncertain whether this be a variety of *P. Vulgata*, or a separate species: Montagu and Fleming inclining to the former, Pennant and Turton to the latter opinion.
- \* **P. INTORTA.** Flem. Brit. An., p. 287. A specimen which with doubt, I have assigned to this species, was found near Seaton, east of Looe. It is seven-tenths of an inch in its longest diameter and about six-tenths in height, smooth, conical, the summit not inclined, bearing resemblance to Pennant's figure of *P. (Emarginula) Fissura*, but

without the slit. The shell was well worn, and therefore probably destitute of marks which in a living state, may characterize it; but it differs so far from Pennant's figure of *P. Intorta*, pl. 90, fig 148, as to leave no doubt of its being distinct.

- \* *P. PELLUCIDA*. Turt. Lin. Pen. Brit. Zo, vol. 4, pl. 90, fig. 150. Mont. Test. Brit., vol. 2, p. 477. Flem. Brit. An. p. 286. Common, but in its different stages of growth so various, as to have led to confusion of the synonyms. Montagu confounded it with *P. Intorta*, a species which it appears, at that time he had not seen.

- \* *P. LEVIS*. Pen. Brit. Zo, vol. 4, pl. 90, fig. 151. Flem. Brit. An., p. 287. Common, on the fronds of the larger sea-weeds.

- \* *P. VIRGINEA*. *P. Parva*. Turt. Lin. Mont. Test. Brit., vol. 2, p. 480. *P. V.* Flem. Brit. An., p. 287. Common, on rocks near low-water mark.

*P. CLEALANDI*. Flem. Brit. An., p. 287. Length about three tenths of an inch, and not quite so wide: the form an irregular cone, the summit elevated, pointed, rather on one side. The edge even, without longitudinal ribs, but with concentric lines of growth. Colour dull white. A single specimen found at Gorran.

- P. BIMACULATA*. Mont. Test. Brit., vol. 2, p. 482, pl. 13, fig. 8. "An opaque oval shell, of a glossy yellow colour, and perfectly smooth, with only the rudiment of a vertex at the smaller end, marked by a transverse, oblong, black spot; another oblong spot of the same colour near the other end, placed longitudinally; the shell is convex, but not much elevated. Inside concave, smooth, glossy, yellow; margin thin. Length a quarter of an inch,

orbicular, subirregular, nearly flat, slightly convex above, with a small apex near the middle; margin acute; inner surface rather concave, with a callous disk, depressed in the centre, with a smooth border) all the recognized species of which are Indian.

### *CALYPTRICIANA.*

Shell always external, covering the animal.

### *EMARGINULA.*

- GENERIC CHARACTER:** Shell shieldlike, conical, vertex inclined, cavity simple, the hinder margin notched.
- **E. FISSURA.** Patella F. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 90, erroneously marked 151. Mont. Test. Brit., vol. 1, p. 490, E. F. Flem. Brit. An., p. 365. Not uncommon, from deep water.

### *FISSURELLA.*

**GENERIC CHARACTER:** Shell shield-like or depressed conical, concave below; without a spire, and perforated at the top; aperture oblong.

- **F. GRÆCA.** Patella G. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 89, fig. 153. Mont. Test. Brit., vol. 2, p. 492. F. G. Flem. Brit. An., p. 364. Rare. I have obtained it from near Looe, at Falmouth, and near the Land's-end but not with the animal. Mr. Forbes (Fauna Monensis) says that their habit is, to attach themselves to Pectens, in deep-water.
- **F. APERTURA.** Patella Fissurella. Turt. Lin. P. Apertura Mont. Test. Brit., vol. 2, p. 492, pl. 13, fig. 10. Flem. Brit. An., p. 364. Very rare.
- **F. NUBECULA.** Flem. Brit. An., p. 365, from Dr. Turton; who obtained it near the Land's-end; from whence also I procured a few specimens. It has been found at Gorran by Mr. Peach.

### *PILEOPSIS.*

**GENERIC CHARACTER:** Shell obliquely conical, curved forward; the top bent, approaching to a spiral; aperture somewhat oval; anterior margin shortest, acute, ending in a slight sinus; hinder margin larger, round; a lengthened, arched, transverse muscular impression under the hinder border.

- **P. HUNGARICUS.** Patella H. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 90, fig. 147. Borlase's Nat. Hist. Corn., pl. 28, fig. 4. P. Ungarica. Mont. Test. Brit., vol. 2, p. 486. Capulus H. Flem. Brit. An., p. 363. Not uncommon on the Pinna from deep water; and one specimen of unusual size had its border so curved to accommodate itself to the irregularity of the surface, as to show that it

had not changed its situation, from an early stage of growth. I have also obtained it, of small size, from the stomach of a fish.

- \* **P. MILITARIS.** Patella M. Mont. Test. Brit., vol. 2, p. 488, pl. 13, fig. 11. Capulus M. Flem. Brit. An. p. 364. At various parts of the coast, but scarce.

**P. ANTIQUATUS?** Montagu describes this shell (*Patella Antiquata*) as liable to great variation; under which it is not improbable that more than one species is included. My specimen, which was attached to a Pinna, was about a line in its longest diameter; texture thin, and in parts nearly transparent: longitudinal lines from the point to the margin simple, causing the edge to be angular; crossed in their progress by circular ridges, seven in number, inclined towards the margin. Curve of the cap to the right, as the broad expanse is placed forward: its form much as in *P. Hungarica*, but more bent down. Colour pale yellow.

#### CALYPTRÆA.

**GENERIC CHARACTER:** The shell conoidal, summit erect, imperforate, subacute. Cavity furnished with an attached, convolute plate.

- C. SINENSIS.** Patella S, Turt. Lin. *P. Chinensis*. Mont. Test. Brit., vol. 2, p. 489, pl. 13, fig. 4. C. Ch. Flem. Brit. An., p. 362. Found on oysters at Helford, and generally wherever native oysters are dredged; but soon falling off spontaneously, it escapes observation.

#### ANCYLUS.

**GENERIC CHARACTER:** The shell ovate, conical, simple, the tip central, posterior, rather obliquely recurved to the right; cavity with a lunate submarginal scar, interrupted on the left side. This genus is by Gray

## BULLÆA.

**GENERIC CHARACTER:** The shell thin, partially rolled and spiral on one side; without columella or spire; aperture large, dilated at the upper part.

**B. APERTA.** Bulla A. Turt. Lin. Mont. Test. Brit., vol. 1, p. 208, pl. vignette, 2 part, fig. 1. Flem. Brit. An., p. 294. Rare. I have met with a specimen much resembling Montagu's account of this shell, but differing sufficiently to require mention; chiefly at the junction of the pillar with the expansion, where the whorl is twisted, and tapers up to join the wing. Length six twentieths of an inch, a little more than four twentieths of an inch wide; white, and slightly transparent.

## BULLA.

**GENERIC CHARACTER:** The shell oval, globular, convolute; no columella, or projecting spire, or only slightly elevated; aperture the length of the shell, outer margin sharp.

Bulla differs from Bullæa, by the shell being completely convolute, always visible externally, which the latter is not; and only partially covered by the hinder part of the animal.

\* **B. LIGNARIA.** Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 70, fig. 83. Borlase's Nat. Hist. Corn., pl. 28, fig. 14. Mont. Test. Brit., vol. 1, p. 235. Flem. Brit. An., p. 292. Not uncommon, chiefly in trawls.

**B. AMPULLA.** Mont. Test. Brit., vol. 1, p. 206, pl. 7, fig. 1. Flem. Brit. An., p. 292. Montagu found two or three of what he believed to be this species, in sand from Falmouth harbour.

**B. UMBILICATA.** Mont. Test. Brit., vol. 1, p. 222, pl. 7, fig. 4. Flem. Brit. An., p. 293. Found by Montagu sparingly, amongst sand from Falmouth harbour.

\* **B. CYLINDRACEA.** Pen. Brit. Zo., vol. 4, pl. 70, fig. 85. Mont. Test. Brit., vol. 1, p. 221, pl. 7, fig. 2. Flem. Brit. An., p. 293. Found by Montagu at Falmouth, and I have obtained it from the byssus of a Pinna.

**B. TRUNCATA,** Turt. Lin. Mont. Test. Brit., vol. 1, p. 223, pl. 7, fig. 5. Flem. Brit. An., p. 293. Found by Montagu, not uncommon in sand at Falmouth.

**B. PATULA,** Pen. Brit. Zo., vol. 4, pl. 70, fig. 85. A. Mont. Test. Brit., vol. 1, p. 207. I have obtained it from the depth of 40 fathoms, on a branch of *Gorgonia Verrucosa*.

## COLIMACEA

The shell spiral, with no other projecting part on the outer surface, than the lines of growth; the right margin of the aperture often recurved, or reflected outwards.



## HELIX.

**GENERIC CHARACTER:** The shell orbicular, convex or conoidal; sometimes globular, the spire rather elevated; aperture entire, transverse, very oblique, contiguous to the axis of the shell; the margins disunited by the projection of the penultimate whorl.

Helix is distinguished from Pupa by the general form of the shell, which is never cylindrical, and by the borders of the aperture being disunited; from Bulimus by the aperture being rather transverse than longitudinal, and its plane very oblique, and almost perpendicular to the axis of the spire; and from Planorbis by the left margin of the aperture being contiguous to the axis of the shell, whereas in that genus it is very remote from it. The right margin, in the adult Helix, is reflected outwards, contrary to what occurs in aquatic shells. Helix is readily known by the projection of the penultimate whorl into the aperture. *Journal of Science*, vol. 15, p. 237.

Mr. Gray denominates the family Helicidæ, and characterizes the genus Helix: shell globose or depressed; mouth semilunar; peristome rather thickened and reflected.

- \* *H. ASPERSA*. *H. Hortensis*. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 84, fig. 129. H. A. Mont. Test. Brit., vol. 2, p. 407. Flem. Brit. An., p. 263. Gray's Turt., p. 128, pl. 4, fig. 35. *Snail*. Common.
- *H. HORTENSIS*. Mont. Test. Brit., vol. 2, p. 412. Flem. Brit. An., p. 264. Gray's Turt., p. 130, pl. 3, fig. 24. Common.
- *H. NEMORALIS*. Pen. Brit. Zo., vol. 4, p. 137. Stew. Elem., vol. 2, p. 414. Mont. Test. Brit., vol. 2, p. 411. Flem. Brit. An., p. 264. Gray's Turt., p. 132, pl. 3,

- **H. GRANULATA.** Gray's Turt., p. 151, pl. 3, fig. 29.  
Not uncommon. It has been confounded with the last.
- **H. CONCINNA.** Gray's Turt., p. 154, pl. 12, fig. 135.  
Common.
- H. DEPILATA.** Gray's Turt., p. 155, pl. 2, fig. 135.\*  
Not uncommon.
- **H. VIRGATA.** Mont. Test. Brit., vol. 2, p. 415. Flem. Brit. An., p. 261. Gray's Turt., p. 160, pl. 4, fig. 31.  
Common and sometimes in profusion, on grass and bushes near the sea. It is most usually found on a sandy soil; and in situations characterized by plenty of sand, it appears earlier in the year, in others scarcely before July. Most of the banded *Helicidæ* have similar habits.
- H. CAPERATA.** Mont. Test. Brit., vol. 2, p. 430. pl. 11, fig. 11. Flem. Brit. An., p. 262. Gray's Turt., p. 162, pl. 4, fig. 32. Local. Montagu seems to have observed it in Cornwall; as I suppose I have also done.
- **H. ERICETORUM.** Turt. Lin. Mont. Test. Brit., vol. 2, p. 437. H. Albella. Pen. Brit. Zo., vol. 4, pl. 35, fig. 122. H. E. Gray's Turt., p. 163, pl. 4, fig. 37.  
Common in sandy districts, especially near the Lands-end and St. Ives.
- H. FUSCA.** Mont. Test. Brit. vol. 2, p. 424, pl. 13, fig. 1. Flem. Brit. An., p. 264. Gray's Turt., p. 147, pl. 4, fig. 36. This shell is distinguished by the circumstance, noticed by Montagu, that its substance is so thin and flexible as, when the animal dies, to contract with it into depressions. I have found a few specimens which were as thin and flexible as tissue paper.
- H. REVELATA.** Gray's Turt., p. 152, pl. 11, fig. 133.  
**H. Subvirescens.** Bellamy's Nat. Hist. South Devon, p. 418, pl. 18. Mr. Bellamy discovered this species near Mevagissey, and it has been since found by Mr. Forbes in Guernsey. Mr. Bellamy's original specimen was examined by the eminent naturalists present at the meeting of the British association at Plymouth in 1841; and especially by Mr. Gray.

#### VITRINA.

**GENERIC CHARACTER:** Shell imperforated; spire depressed, of only a few whorls; mouth large, rounded, lunate; peristome thin.

- V. PELLUCIDA.** Gray's Turt., p. 120, pl. 3, fig. 21.  
Scarce.

#### ZONITES.

**GENERIC CHARACTER:** The shell depressed, hemispherical, thin, with a flattish spire, and a large lunate mouth, with thin simple lips, that are neither thickened nor reflexed.

This genus, which seems perfectly natural, is adopted by Mr. Gray from Mountfort; and is to be regarded as an amendment of the system of Lamarck.

**Z. ROTUNDATUS.** *Helix Radiata.* Mont. Test. Brit., vol. 2, p. 432. *H. Rotundata.* Flem. Brit. An., p. 263.

*Z. R.* Gray's Turt. p. 165, pl. 5, fig. 44. Common.

**Z. CELLARIUS.** *H. Nitens.* Turt. Lin. *H. Lucida.* Mont. Test. Brit., vol. 2, p. 425. *Z. C.* Gray's Turt., p. 170, pl. 4, fig. 40.

Montagu gives the following account of what he supposes to have been a variety of this species. Those found at Newbury on peat were dark, and never exceed a quarter of an inch in breadth. "That found under water was crawling upon Brooklime, and was considerably larger; it was in a water course, or drain to a swamp, near Penzance in Cornwall. These however appear from their shape to be the same, but whether they are really distinct from the *Lucida* (*Z. C.*) or only varieties, the observations of future Conchologists must determine. We do not recollect whether the animal we found under water was of the true aquatic kind, or whether it possessed four retractile tentacula, and had by accident fallen into that element; but we never before or since, found one so large, so extremely thin and pellucid, or of so light a colour.

\* **Z. CRYSTALLINUS.** Gray's Turt., p. 176, pl. 4, fig. 42.  
Not common.

**Z. ALLIARIUS.** Gray's Turt., p. 168, pl. 4, fig. 39.  
Scarcely common.

#### SUCCINEA.

**GENERIC CHARACTER:** The shell oval, oblong, thin, with a short conical spire and rapidly enlarging whorls



than the next; aperture oval, entire at the base, not half as long as the spire, and without teeth; the peristome interrupted; outer lip generally thickened and reflexed.

The shell of this genus is distinguished from that of *Limnæus* by wanting the oblique fold on the pillar; from *Clausilia*, in being regular, and in having the peristome simple and interrupted; and from *Pupa* in having the spire regularly tapering.

- **B. ACUTUS.** *Turbo Fasciatus.* Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 82, fig. 119. Stew. Elem., vol. 2, p. 410. Mont. Test. Brit., vol. 2, p. 346. B. A. Flem. Br. An., p. 265. Gray's Turt., p. 184, pl. 6, fig. 17. Abundant in the heat of summer, in some situations near the sea; and remarkably so in the west of the county, in sandy soil. This shell is sometimes carried into the sea to a considerable distance. I have taken it from the stomach of a Dab (*Pleuronectes Limanda*) that had swallowed it, in company with other small shells, for the sake of the Hermit Crab that occupied it. I have also found it mixed with shellsand from the Isle of Sark.

- B. OBSCURUS.** *Helix O.* Mont. Test. Brit., vol. 2, p. 391. Flem. Br. An., p. 265. Gray's Turt., p. 183, pl. 6, fig. 63. Not common.

#### ZUA.

**GENERIC CHARACTER:** The shell ovate, subcylindrical, somewhat blunt, with a smooth polished periostraca; mouth ovate, thickened and united all round; peristome toothless; axis imperforated.

- **Z. LUBRICA.** *Helix L.* Turt. Lin. Mont. Test. Brit., vol. 2, p. 390. *Bulimus L.* Flem. Brit. An., p. 265. *Z. L.* Gray's Turt., p. 188, pl. 6, fig. 65. Common.

#### PUPA.

**GENERIC CHARACTER:** The shell cylindrical, abruptly obtuse; whorls close pressed, gradually enlarging; mouth semi-oval, mostly toothed inwardly; peristome reflexed, and interrupted behind.

- **P. UMBILICATA.** *Turbo Muscorum.* Turt. Lin. Mont. Test. Brit., vol. 2, p. 335. Flem. Brit. An., p. 268. *P. U.* Gray's Turt. p. 194, pl. 7, fig. 78. Common.

#### VERTIGO.

**GENERIC CHARACTER:** The shell subcylindrical, abruptly obtuse, the whorls close pressed, gradually enlarging; mouth contracted, more or less angular, generally toothed inwardly, and thickened by an exterior rib; peristome simple. This genus has been separated from that of *Pupa*, because the animal has only the upper pair of tentacles, which bear the eyes, developed.

\* *V. EDENTULA*. Gray's Turt., p. 199, pl. 7, fig. 80.  
Locally common.

*V. PYGMÆA*. Turbo Sexdentatus, Junior. Mont. Test. Brit., vol. 2, p. 337, pl. 12, fig. 8. V. P. Gray's Turt., p. 202, pl. 7, fig. 83. Montagu found it in a boggy place in Cornwall, on the yellow water flag; and I believe I found it in a pond at Pentuan.

#### BALÆA.

**GENERIC CHARACTER:** The shell reversed, thin, with a lengthened, taper spire, the last volution larger than the next, aperture roundish oval, entire at the base, oblique, with a single tooth on the pillar, which is wanting in the young shells, and the pillar is destitute of any valvelike plait or clausium. From *Bulimus* and *Pupa* this genus is distinguished by the aperture being left handed; from *Clausilia* in having the ultimate volution proportionately larger than the next; and from *Vertigo*, in the regularity of its mouth. From the young of *Clausilia* it may be known by the front of the last whorl being convex and simple, not flattened and furnished with a keeled ridge near the outer edge. Gray.

\* *B. PERVERSA*. Turbo P. Mont. Test. Brit., vol. 2, p. 355, pl. 11, fig. 12. B. P. Flem. Brit. An., p. 271. Gray's Turt., p. 207, pl. 6, fig. 70. Common.

#### CLAUSILIA.

**GENERIC CHARACTER:** The shell reversed, with a lengthened, slender, spindle formed spire, the last volution less tumid than the one before it, with an obtuse or papillary summit; aperture oval, oblique, united all round and margined, toothed; throat with an internal spiral

on the centre of the foot, and covered with a thin mantle, with a thickened edge, which is itself covered with an external spiral shell, which has a plaited pillar in all its ages."

#### CARYCHIUM.

**GENERIC CHARACTER:** The shell spiral, thin, conic ovate; mouth oblong, longitudinal, two or three toothed, compressed, rather oblique, rounder at each end; peristome interrupted, thickened, and rather reflexed.

**C. MINIMUM.** *Helix Carychium.* Turt. Lin. Turbo C. Mont. Test. Brit. vol. 2, p. 339. C. M. Flem. Brit. An., p. 271. Gray's Turt., p. 221, fig. , p. 219. Not uncommon.

#### CYCLOSTOMA.

**GENERIC CHARACTER:** Shape of the shell variable; whorls of the spire cylindrical; aperture round, regular; the margins circularly united, or reflected by age. An operculum.

Mr. Gray constituted this a family under the name of Cyclostomidæ. His generic character of Cyclostoma is: shell ovate, spiral; mouth simple, united all round; operculum of a few flat whorls, with a simple shelly internal coat: the foot divided into two parts by a longitudinal central groove.

**C. ELEGANS.** Turbo Tumidus. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 82, fig. 110. T. Elegans. Mont. Test. Brit., vol. 2, p. 342. C. E. Flem. Brit. An., p. 257. Gray's Turt., p. 275, and fig. 1, 2, 3, p. 273, and pl. 7, fig. 75. I have only obtained a specimen, by gift, from the west of the county.

#### LIMNÆANA.

The shell spiral, the outer surface mostly smooth; right margin of the aperture acute, and not reflected.

Mr. Gray denominates the family Limnæadæ; and observes that the forms of the shells vary much in different genera, "in shape and form;" but the group is natural, from the similarity of the animals.

#### LIMNÆUS.

**GENERIC CHARACTER:** The shell ovate, thin, dextral, transparent, spiral; mouth ovate, with a single, oblique plait on the middle of the column, running into the axis: Gray; who observes, this genus is known from *Amphipeplea* and *Physa* by the inner lip not being extended over the body whorl of the shell; and from *Applexus* by the shell being dextral and having the pillar plait.

\* **L. PEREGER.** *Helix Peregra.* Turt. Lin. H. Putris. Pen. Brit. Zo., vol. 4, pl. 86, fig. 137. H. P. Mont. Test.

- Brit., vol. 2, p. 373, pl. 16, fig. 3. *L. Limosa*. Flem. Brit. An., p. 275. *L. P.* Gray's Turt., p. 233, pl. 9, fig. 101. Common.
- L. PALUSTRIS.** *Helix P.* Turt. Lin. *H. Stagnalis*, var. Pen. Brit. Zo., vol. 4, pl. 86, fig. 136. *B. H. P.* Mont. Test. Brit., vol. 2, p. 370, pl. 16, fig. 10. Flem. Brit. An., p. 274. Gray's Turt., p. 239, pl. 9, fig. 107. Not common.
- **TRUNCATULUS.** *Helix Fossaria*. Mont. Test. Brit., vol. 2, p. 372, pl. 16, fig. 9. *L. F.* Flem. Brit. An., p. 274. *L. T.* Gray's Turt., p. 240, pl. 9, fig. 108. Irregularly distributed. Montagu found it "upon the top of one of the highest hills in Cornwall, at the verge of a spring near the Lizard, where no other species of shell was to be found".
- L. GLABER.** *Helix Octona*. Pen. Brit. Zo., vol. 4, pl. 86, fig. 135. *H. Octanfracta*. Mont. Test. Brit., vol. 2, p. 396, pl. 11, fig. 8. *L. Octona*. Flem. Brit. An., p. 274. *L. G.* Gray's Turt., p. 242, pl. 9, fig. 106. The indefatigable Montagu says, "we have found it only in one part of England, a splashy place by the road side (a muddy pool by the side of the high road on the top of a hill) half way between Fowey and Looe in Cornwall, where they were plentiful in all stages of growth; the young are less slender, and have only five or six volutions." Such however have been the changes effected within the space of forty years, that I have hitherto failed in discovering these shells.

#### PLANORBIS.

**GENERIC CHARACTER:** The shell discoidal, spire depressed, and all the whorls appearing above and beneath ;

tions on the inner face of the right margin. Operculum with a projecting tooth.

- \* **N. LITTORALIS.** Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 87, fig. 143. Mont. Test. Brit., vol. 2, p. 467. Stew. Elem., vol. 2, p. 417. Flem. Brit. An., p. 318. Abundant. The Turbo Neritoides, as marked in the collection of the Museum, from the Mediterranean, is too clearly like a variety of this shell with alternate broad stripes of yellow and brown in the direction of the whorls crossed by zigzag markings of the same, to admit of a doubt as to their identity with those found on our shores; but in the shell at least, there is not sufficient grounds for considering them as forming a distinct species.

#### NATICA.

**GENERIC CHARACTER:** The shell subglobular, umbilicated; aperture entire, semicircular; left lip oblique, not toothed, callous; the callosity modifying the umbilicus, and sometimes covering it; right lip acute, always smooth inside. An operculum.

- \* **N. GLAUCINA.** Nerita G. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 87, fig. 141. Mont. Test. Brit., vol. 2, p. 469. Stew. Elem., vol. 2, p. 417. Natica G. Flem. Brit. An., p. 319. N. Monilifera. Forbes, Fauna Monensis, p. 29. Common of small size; but I have never seen it so large any where else as at Par.
- N. ALDERI.** Forbes, Fauna Monensis, p. 31. This species has been lately discovered, as distinguished from the last, with the young of which it has been confounded. Two specimens were procured from near the Land's-end.
- N. NITIDA.** Flem. Brit. An., p. 319. A single specimen was obtained from near the Land's-end. For the two last named species, as well as several other of the smaller species of Cornish shells, I am indebted to the kindness of Mr. William Curnow, Gardener, of Newlyn; who has collected them with persevering industry.
- \* **N. PALLIDULA.** Nerita P. Turt. Lin. Mont. Test. Brit., vol. 2, p. 468. Stew. Elem., vol. 2, p. 418. Flem. Brit. An., p. 320. Not common. I found a specimen at Tolland sand.
- \* **N. LACUNA.** Helix L. Mont. Test. Brit., vol. 2, p. 423, pl. 13, fig. 6. Natica L. Flem. Brit. An., p. 320. Scarcely common.

#### IANTHINEA.

The shell inflated, conoidal, thin; aperture triangular. Columella straight, projecting beyond the base of the right lip; which has a sinus in the middle. No operculum.



## IANTHINA.

**GENERIC CHARACTER:** The shell inflated, conoidal, thin, transparent; aperture triangular; columella straight, passing beyond the base of the right lip.

- **I. COMMUNIS.** *Helix Ianthina.* Turt. Lin. J. C. Flem. Brit. An., p. 326. Crouch's Intro., pl. 16, fig. 3. The species has been found on several parts of our north and south coast; I found it myself at St. Ives, and I possess two or three specimens that came on shore not far from my own residence. Their occurrence however, is altogether casual, and depends on a combination of wind and weather. The usual season is from July to November, when the wind is rough or long between west or south; under which circumstances several floating animals, as *Physalia*, *Velella*, with the *Ianthinæ*, are driven on our coast from the Atlantic, sometimes in considerable numbers. This shell, however, is so brittle, as scarcely to bear the touch of land; and in consequence, vigilance must be joined with good fortune, to obtain sound specimens.

**I. EXIGUA.** Turton, Mag. Nat. Hist., vol. 7, p. 352.

Turton says. "In the small coves about the Land's-end, in Cornwall, the *Ianthina Fragilis* (*Communis*) is occasionally wafted, by a gentle south west wind, in prodigious fleets; all alive, and born up upon the water by their clusters of tough bubble like vesicles. By the retreating waves, most of them are carried back into the ocean; so that it requires a fortunate combination of tide, wind, and wave, to see them in all their splendour. This most happens about the months of July and August. The fishermen's wives call them Bull-horns, which supposes a prior knowledge of their appearance. Among them are sometimes found a few of *I. Exigua*, which

## SIGARETUS.

**GENERIC CHARACTER:** The shell earshaped, nearly orbicular; left lip short and spiral; aperture entire, much dilated, rounded, oblong; margins not united.

- \* *S. PERSPICUUS*. *Bulla* Haliotoidea. Mont. Test. Brit., vol. 2, p. 211. pl. 7, fig. 6. *S. Haliotoideus*. Flem. Brit. An., p. 360. *S. P.* Forbes, *Fauna Monensis*, p. 29. Obtained from near the Land's-end.

## PLICACEA.

Aperture of the shell not effuse; columella plaited.

## TORNATELLA.

**GENERIC CHARACTER:** The shell convolute, ovate cylindrical, mostly striated transversely; no epidermis; aperture oblong, entire, the right lip sharp; one or more plaits on the columella.

- T. TORNATILIS*. *Voluta* T. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 71, fig. 86. *T. T.* Flem. Brit. An., p. 336. I have only seen two specimens; which were procured from the west of the County.

- T. DENTICULATA*. *Voluta* D. Mont. Test. Brit., vol. 1, p. 234. *Actæon* D. Flem. Brit. An., p. 337. A specimen from the Land's-end.

## SCALARIANA.

Without plaits on the columella; margins of the aperture circularly united. Shells of this family have a tendency to form a loose spire, so that the whorls are often disunited and do not rest on one another. This is so remarkable in the genus *Vermetus*, that its most proper place would seem to be among the *Serpulaceæ*; but the shell is not attached to a foreign body, being commonly twisted together; and the animal is altogether different, not being of the annulated order, but a true mollusc. Jour. Science.

## VERMETUS.

**GENERIC CHARACTER:** Shell thin, tubular, loose spiral, adhering by the spire. Aperture orbicular, margins united. Operculum cartilaginous.

- \* *V. INTORTUS*. *Vermiculum* I. Mont. Test. Brit., vol. 2, p. 520. Flem. Brit. An., p. 233. Not uncommon.  
*V. PERFORATUS*. *Vermiculum* P. Mont. Test. Brit., vol. 2, p. 519. "We have found it in Cornwall, and sometimes with the small interior compartment worn off which gives it the appearance of being naturally perforated." Montagu.

## SCALARIA.

**GENERIC CHARACTER:** The shell subturreted, spire more or less elongated, the last whorl rather larger than the

next preceding; ribs longitudinal, elevated, interrupted, subacute. Aperture nearly round; the margins circularly united, and terminated by a thin curved wart.

- \* **S. CLATHRUS.** Turbo C. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 81, fig. 111. A. Stew. Elem., vol. 2, p. 408. Mont. Test. Brit., vol. 2, p. 296. Borlase, Nat. Hist. Corn., pl. 28, fig. 9. *Scalaria C.* Flem. Brit. An., p. 310. Rare. I have obtained it from Hannafore, near Looe, and from the Land's-end.

- \* **S. CLATHRATULUS.** Turbo C. Turt. Lin. Mont. Test. Brit., vol. 2, p. 297. Sc. C. Flem. Brit. An., p. 311. Rare. I have only seen it from near the Land's-end.

- S. TURTONI.** Flem. Brit. An., p. 311. The only specimen I have seen, and which was obtained at Falmouth, differs in some respects from the description given by Fleming. The length is about an inch: the lower whorl less inflated than in *Sc. Clathrus*, tapering regularly to the point. Ribs twelve, flat, and of various sizes, not continuous across the line of separation: so that few of them on the next whorl, are exactly opposite those of the former, and even the number on each varies. Colour pale brown, with two or three darker spiral bands.

#### **TURBINACEA.**

The shell turreted or conoidal, aperture round or oblong, not dilated; the margins disunited. When placed on their base, the axis is always more or less inclined, never vertical. Journ. Science.

#### **TROCHUS.**

**GENERIC CHARACTER:** The shell conoidal, spire

pressed form than the younger one, in consequence of the expansion of the lower whorl.

- \* **T. EXASPERATUS.** Pen. Brit. Zo., vol. 4, p. 126. T. Exiguus. Mont. Test. Brit., vol. 1, p. 277. T. E. Flem. Brit. An. p. 233. Rare. Dr. Maton found it near the Land's-end.
- \* **T. STRIATUS.** Turt. Lin. Mont. Test. Brit., vol. 1, p. 278. Flem. Brit. An., p. 323. Local. Montagu found it in abundance in sand at Falmouth.
- \* **T. CRASSUS.** Turbo Lineatus. Turt. Lin. Trochus C. Mont. Test. Brit., vol. 1, p. 281. Stew. Elem., vol. 2, p. 406. Flem. Brit. An., p. 322. Abundant.
- \* **T. MAGUS.** Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 80, fig. 107. Mont. Test. Brit., vol. 1, p. 283. Stew. Elem., vol. 2, p. 405. Flem. Brit. An., p. 321. Common.
- \* **T. UMBILICATUS.** Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 80, fig. 106. Mont. Test. Brit., p. 286. Flem. Brit. An., p. 322. Common.
- \* **T. CINERARIUS.** Turt. Lin. Pen. Brit. Zo., vol. 4, p. 127. Mont. Test. Brit., vol. 1, p. 284. Flem. Brit. An., p. 322. Common.

#### TURBO.

**GENERIC CHARACTER:** The shell conoidal or sub-turreted; the circumference never compressed; aperture entire, round, not modified by the next but last whorl; margins disunited above. Columella arched, flattened, not truncated at the base. An operculum.

- \* **T. LITTOREUS.** Turt. Lin. Pen. Brit. Zo., vo. 4, pl. 81, fig. 109. Stew. Elem., vol. 2, p. 407. Mont. Test. Brit., vol. 2, p. 301. Flem. Brit. An., p. 298. *Wrinkle, Periwinkle.* Common, and abundantly used as food.
- \* **T. RUDIS.** Turt. Lin. Mont. Test. Brit., vol. 2, p. 304. Common, but less abundant than the last. It also keeps more in harbours, and higher on rocks, so as to be left exposed by the tide for many hours, indeed in many instances they are so far removed above the influence of even the highest tides, that nothing but the spray of the sea can reach them. The young are produced alive, about midsummer.
- \* **T. MAMMILLATUS.** Flem. Brit. An., p. 299. "According to a memorandum in the handwriting of Da Costa, annexed to one of the specimens figured by Donovan, this shell has been found by Mr. Platt on the Scilly rocks." Fleming. Amongst the shells furnished to me by the kindness of Mr Curnow of Newlyn, I find three specimens from the Land's-end.

#### SKENEA.

**GENERIC CHARACTER:** Spire depressed, and destitute of spinous processes. Fleming. The form of the

shell is depressed, almost like that of *Valvata*; the whorls appearing both above and below. The form of the animal fixes them in this family.

**SK. DEPRESSA.** *Helix* D. Mont. Test. Brit., vol. 2, p. 439, pl. 13, fig. 5. S. D. Flem. Brit. An. p. 313. About low water mark, on sea weed, and perhaps common; but from its small size overlooked.

#### CINGULA.

**GENERIC CHARACTER:** The shell oblong, turreted, pointed; spire long, with numerous whorls; aperture round or oval, pointed posteriorly, dilated anteriorly; outer lip slightly thickened, emarginated; operculum horny.

This genus is denominated *Cingula* by Dr. Fleming, and Rissoa by Freminville as quoted by Sowerby (*Conchological Manual*), from whom the generic character is derived; and who observes, they are considered by some authors as resembling *Melania* (of Lamarck), but placed by Sowerby near the *Scalariæ*.

\* **C. STRIATULA.** *Turbo* S. Turt. Lin. Mont. Test. Brit. vol. 2, p. 306, pl. 10, fig. 5. C. S. Flem. Brit. An., p. 305. In shell sand; when on places on the coast where the eddy is favourable, the smaller shells comprized in this and the neighbouring genera are preserved, when the larger species are dashed to pieces. Montagu found it at Falmouth.

\* **C. COSTATA.** *Turbo* C. Turt. Lin. Mont. Test. Brit., vol. 2, p. 311, pl. 10, fig. 6. C. C. Flem. Brit. An., p. 305. In shell sand, not uncommon.

\* **C. PARVA.** *Turbo Aereus*. Turt. Lin. T. Parvus. Mont. Test. Brit., vol. 2, p. 310. C. P. Flem. Brit. An. p. 306. Montagu found it abundant at Falmouth and

- **C. PULLUS.** Turbo P. Turt. Lin. Mont. Test. Brit., vol. 2, p. 319. C. P. Flem. Brit. An., p. 308. Common.
- **C. RETICULATA.** T. Punctura. Mont. Test. Brit., vol. 2, p. 320, pl. 12, fig. 5, and T. Reticulatus, p. 322: the latter supposed to be the older state. T. R. Turt. Lin. C. R. Flem. Brit. An., p. 306. Not uncommon in shell sand, near Looe.
- C. RUBRA.** Turbo R. Mont. Test. Brit., vol. 2, p. 320. Turt. Lin. L. R. Flem. Brit. An., p. 308.  
Montagu says "we found this species at Whitsand-bay in Cornwall, and with it a shell in every respect like, but in colour, which is perfectly white, and so transparent that the whole of the columella may be seen through the shell."
- C. VITREA.** T. Vitreus. Mont. Test. Brit., vol. 2, p. 321. pl. 12, fig. 3. C. V. Flem. Brit. An., p. 308. In shell sand, near Looe.
- **C. QUADRIFASCIATA.** Turbo Q. T. Vinctus. T. Casalis. Mont. Test. Brit., vol. 2, p. 307, 309, 328. C. Q. Flem. Brit. An., p. 299. In shell sand along our south coast.
- C. INTERRUPTA.** Turbo I. Turt. Lin. Mont. Test. Brit., vol. 2, p. 329. C. I. Flem. Brit. An., p. 308. On the south coast, in shell sand.
- **C. CINGILLA.** Turbo C. Mont. Test. Brit., p. 328. C. C. Flem. Brit. An., p. 309. On the south coast, in shell sand.
- C. FULGIDA.** Turbo F. Mont. Test. Brit., vol. 2, p. 332. Found in sand by Montagu.
- **C. LABIOSA.** Turbo L. Mont. Test. Brit., vol. 2, p. 400, pl. 13, fig. 7. C. L. Flem. Brit. An., p. 307. Not uncommon.

#### PHASIANELLA.

**GENERIC CHARACTER:** The shell ovate or conical, solid; aperture entire, oval longitudinal, round at the lower part and contracted at the upper; lips disunited above, the right sharp, not reflected. Columella smooth, compressed, attenuated at the base. Operculum calcareous or horny.

- **P. POLITA.** Helix P. Mont. Test. Brit., vol. 2, p. 398. Turbo P. Turt. Lin. P. P. Flem. Brit. An., p. 301. Obtained sparingly along our south coast from the Land's-end. I have found it with the animal in crab-boats; which shows it to inhabit in from five to ten fathoms.
- **P. PALLIDA.** Turbo P. Mont. Test. Brit., vol. 2, p. 325. P. P. Flem. Brit. An., p. 302. In shell sand near Looe.

#### TURRITELLA.

**GENERIC CHARACTER:** The shell turreted, not pearly; aperture rounded, entire; the margins disunited

at the upper part; a sinus in the right lip. Operculum horny.

- \* **T. TEREBRA.** Turbo T. Turt. Lin. Pen. Brit. Zo., vol 4, pl. 81, fig. 113. Mont. Test. Brit., vol. 2, p. 293. Turritella T. Flem. Brit. An., p. 302. Sparingly along the south coast, from the Land's-end.
- \* **T. ELEGANTISSIMA.** Turbo E. Mont. Test. Brit., vol. 2, p. 298, pl. 10, fig. 2. Turritella E. Flem. Brit. An., p. 303. Montagu found it not uncommon in sand from Falmouth harbour, and I have obtained it from the Land's-end.
- T. NITIDISSIMA.** Turbo N. Mont. Test. Brit., vol. 2, p. 299, pl. 12, fig. 1. Flem. Brit. An., p. 304. Montagu found it in sand from Falmouth harbour.
- T. UNICA.** Turbo Albidus. Turt. Lin. T. U. Mont. Test. Brit., vol. 2, p. 299, pl. 12, fig. 2. Turritella U. Flem. Brit. Ann., p. 303. Rare. In sand from Falmouth, by Montagu.

#### *CANALIFERA.*

The shell with a canal, variable in length, at the base of the aperture, the right margin of which does not alter by age. An operculum. The first division, with no constant wart on the right lip.

#### *CERITHIUM.*

**GENERIC CHARACTER:** The shell turreted, aperture short, oblong, oblique, the bottom ending in a short or curved canal, never notched. A slight channel at the upper extremity of the right lip. Operculum small, roundish, horny.

- C. COSTATUM.** Strombus C. Mont. Test. Brit., vol. 1, p. 225. C. C. Flem. Brit. An., p. 357. Very rare. Da Costa found it in Cornwall.

lengthened; no fissure in the right lip. Columella smooth. Operculum horny.

- F. CORNEUS.** Murex C. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 76, fig. 99. Mont. Test. Brit., vol. 1, p. 258. F. C. Flem. Brit. An., p. 348. I have only met with one specimen, which was taken in a trawl at Falmouth.
- \* **F. DESPECTUS.** Flem. Brit. An., p. 349. Not common.
- \* **F. PURPUREUS.** Murex P. Mont. Test. Brit., vol. 1, p. 260, pl. 9, fig. 3. F. P. Flem. Brit. An., p. 350. Scarce. In shell sand on the south east coast.
- F. LINEARIS.** Murex L. Mont. Test. Brit., vol. 1, p. 261, pl. 9, fig. 4. F. L. Flem. Brit. An., p. 350. Scarce, in shell sand.
- \* **F. MURICATUS.** Murex M. Mont. Test. Brit., vol. 1, p. 262, pl. 9, fig. 2. F. M. Flem. Brit. An., p. 351. Scarce, in shell sand on the south east coast, and near the Land's-end.
- F. COSTATUS.** Murex C. Mont. Test. Brit., vol. 1, p. 265. F. C. Flem. Brit. An., p. 349. Rare, in shell sand.
- F. ATTENUATUS.** Murex A. Mont. Test. Brit., vol. 1, p. 266, pl. 9, fig. 6. F. A. Flem. Brit. An., p. 350. Rare, in shell sand.
- F. NEBULA.** Murex Acuminatus. Pen. Brit. Zo., vol. 4, pl. 79. M. N. Mont. Test. Brit., vol. 1, p. 367. F. N. Flem. Brit. An., p. 360. Found at Falmouth by Montagu.
- \* **F. SEPTANGULARIS.** Murex S. Mont. Test. Brit., vol. 1, p. 268, pl. 9, fig. 5. F. S. Flem. Brit. An., p. 350. In shell sand, from the Land's-end along the south coast, not uncommon.

#### TRITON.

**GENERIC CHARACTER:** The shell oval or oblong, channelled at the base; the prominences either alternate or rare, or nearly solitary, and never forming a longitudinal row; aperture oblong. An operculum.

Sometimes the Triton has only one prominence, on the right lip, which is never wanting. These prominences are never spinous.

- \* **T. ERINACEUS.** Murex E. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 76, fig. 95. Stew. Elem., vol. 2, p. 403. T. E. Flem. Brit. An., p. 356. Common, though scarcely abundant. Young shells differ in having the outer lip comparatively thin, and the pillar narrow.

#### ALATA.

The shell with a more or less lengthened canal at the bottom of the aperture, the right lip of which changes its form with age, and has a sinus at the lower part.



## ROSTELLARIA.

**GENERIC CHARACTER:** The shell spindle shaped or subturreted, ending in a beak shaped canal; right lip entire or toothed, more or less dilated with age; a sinus near the canal.

- \* **R. PES PELECANI.** Strombus P. P. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 75. Stew. Elem., vol. 2, p. 402. Mont. Test. Brit., 1, p. 253. R. P. P. Flem. Brit. An., p. 359. Not uncommon. No animal seems to be better protected from harm, than this; and yet I have obtained it, of full growth, from the stomach of a species of starfish (*Asterias Papposa*) of no large size. When the soft portion has been digested, the empty shell is rejected, and thus becomes the habitation of the *Sipunculus Strombus*; which forms a nest for itself by narrowing the entrance with agglutinated sand.

## PURPURIFERA.

The shell with a short canal ascending posteriorly, or an oblique notch or half canal at the bottom of the aperture; directed towards the back. Columella flattened, pointed at the base.

## PURPURA.

**GENERIC CHARACTER:** Shell oval, smooth, tubercular or angular; aperture dilated, the lower part terminating in an oblique subcaniculated notch. Columella flattened, pointed at the base.

- \* **P. LAPILLUS.** Buccinum L. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 72, fig. 89. Borlase's Nat. Hist. of Corn., pl. 28. Mont. Test. Brit., vol. 1, p. 239. Stew. Elem., vol. 2, p. 401. P. L. Flem. Brit. An., p. 341.

Martens has rightly observed that this common shell is



occurring at a different part of its surface, from that of the former. The spire also is more obscure, of less proportionate diameter, and with fewer revolutions. The canal is shorter and less deflected: the replication covering a greater portion of the columella. It is subject to similar variety in the tubercles of the outer lip; but they are fully formed only in advanced age. The colour is usually much brighter than that of *P. L.*; but it is sometimes banded, as in that species. Although from injury received in growth, specimens of *P. Lapillus* may be sometimes found, which approach somewhat nearly to the other, yet in well formed specimens the differences are so great as to leave little room for doubt of their being distinct. I have seen three specimens of this animal, with the extremity of their shells inserted under that of a common Limpet, and feeding on its flesh.

#### BUCCINUM.

**GENERIC CHARACTER:** The shell oval or ovate, conical. Aperture longitudinal, with a notch at the base; but no canal. Columella not flattened, turgid at the upper part.

Lamarck had separated into a distinct genus, under the name of *Nassa*, those which have a callous columella; but he has since reunited them to the *Buccina*.

\* *B. UNDATUM*, and *B. STRIATUM*. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 73, and pl. 74. Stew. Elem., vol. 2, p. 401. B. U. Mont. Test. Brit., vol. 1. p. 237. Flem. Brit. An., p. 342. Common in moderately deep water, and often taken up attached to fishermen's lines. It is frequently devoured by the Scate, the animal with the operculum attached being found in its stomach; but it seems that the shell is speedily rejected, and in this state it affords an habitation for the Hermit Crab: the largest specimens of which are commonly found in these shells. A curious net work of membranous capsules, sometimes as large as the clenched fist, found on the shore after stormy weather, is the case in which the spawn of this animal is produced. In their original state, they are attached to stones or shells; and when washed on shore, often contain the young shell, which differs much from the adult shape.

\* *B. RETICULATUM*. Turt. Lin. Pen. Brit. Zo., vol. 4, pl. 72, fig. 88, and 92. Mont. Test. Brit., vol. 1, p. 240. Stew. Elem., vol. 2, p. 401. Nasa R. Flem. Brit. An., p. 340. Common, between the tide marks.

*B. LINEATUM*. Turt. Lin. Mont. Test. Brit. vol. 1, p. 245. Flem. Brit. An., p. 344. Da Costa found it in Cornwall.

\* **B. INCRASSATUM.** *B. Minimum.* Turt. Lin. *B. Minimum.* Pen. Brit. Zo., vol. 4, pl. 79, inner angle beneath the left hand. *B. Macula.* Mont. Test. Brit., vol. 2, p. 241, pl. 8, fig. 4. *Nassa I.* Flem. Brit. A., p. 340. Common.

Naturalists seem to have overlooked, or considered perhaps as a younger state, of this shell, one that seems to have good claims to be regarded as a distinct species. Its general form is like that of *B. I.* but the whorls and ribs have a more inflated appearance. This is more especially the case with the outer lip, which, viewed from above, shews more dilated; but observed below, that which in the one is more solid and tuberculated, is in the other hollowed out, inflected and thin: leaving the aperture more than twice as large, in shells of equal magnitude. The outer edge is also more circular, advances further up the whorl, and closes more over it. There is no plait over the columella, the pillar of which is less solid, and without the perpendicular line seen on *B. I.* The substance also is more thin. It is scarcely common, but occurs in similar situations with the other, along our coast.

**B. BREVE?** A small shell which answers best to the obscure species referred to by Montagu, vol. 1, p. 250, and by Fleming, p. 344, as described by Walker under this name, is among the small collection I was favoured with by Mr. Curnow of Newlyn; who obtained it near the Land's-end. The length of the specimen is about a line; the greatest breadth something less. The whorls five, rounded, separated by a well marked division; summit rather blunt; upper whorls smooth, perhaps from having been rubbed: the two lower whorls prominently ribbed: the ribs wide, high, regular, rounded: those on the lower

## VOLUTA.

**GENERIC CHARACTER:** The shell oval, more or less inflated; apex blunt or papillary; the base notched; no canal. Columella plaited; the plaits parallel, transverse, the lower smallest; columellar lip thin and formed on the pillar.

**V. CATENATA.** Mont. Test. Brit., vol. 1, p. 236. Flem. Brit. An., p. 333.

Montagu acknowledges his obligations to Mr. Swainson for all he knew of this shell. The latter gentleman's observations are, "I never found this shell alive; I got three or four dead specimens, in the sediment at the bottom of pools of water (if they may be so called) left in the holes of the rocks in St. Austle-bay, near Fowey; have heard of its being taken off the Lizard, and also at Penzance."

## MARGINELLA.

**GENERIC CHARACTER:** The shell ovate oblong, smooth; spire short; right lip thickened on the outside; base of the aperture scarcely notched; plaits on the columella nearly equal.

\* **M. VOLUTA.** Cypræa V. Mont. Test. Brit., vol. 1, p. 203, pl. 6, fig. 7, and Bulla Diaphana, Mont. Test. Brit., vol. 1, p. 225, pl. 7, fig. 8.

Montagu found a mutilated specimen of his Bulla Diaphana, now judged to be the former species in its younger state, at Falmouth; and I have obtained specimens of both states from the Land's-end. The difference between M. V. and B. D., is so great, that close observation of many individuals is necessary to prove them the same.

## VOLVARIA.

**GENERIC CHARACTER:** The shell cylindrical, convolute; spire scarcely projecting; aperture narrow, the length of the shell. One or more folds on the lower part of the columella.

**V. PALLIDA.** Voluta P. Turt. Lin. Mont. Test. Brit., vol. 2, p. 232. V. P. Flem. Brit. An., p. 333. Crouch's Intro., pl. 19, fig. 15. Very rare.

## CONVOLUTA.

The shell without a canal, but having the base of the aperture channelled or effused the whorls large, compressed, convolute, the last nearly covering the whole of the others.

## CYPRÆA.

**GENERIC CHARACTER:** The shell oval, or ovate oblong, convex; the lips curved inwards; aperture longitudinal, narrow, toothed on both sides, the extremities effuse. Spire very small, hardly perceptible.

\* *C. EUROPÆA*. *C. Pediculus*. Tart. Lin. Borlase's Nat. Hist. Corn., pl. 28, fig. 12. Stew. Elem., vol. 2, p. 397. Mont. Test. Brit., vol. 1, p. 200. *C. E. Flem. Brit. An.*, p. 330. In its young state this is altogether unlike the perfect shell, and constitutes the *C. Bullata* of Montagu, Test. Brit., vol. 1, p. 202, pl. 6, fig. 1. In this condition they differ greatly in size; but whatever be the magnitude obtained, the further progress towards the perfect markings is not accompanied with enlargement: so that many matured shells are much smaller than others in their first growth. When the form and striation are in the intermediate state, they constitute the *Cypræa Arctica* of Montagu, vol. 1, p. 201. These changes are rapidly passed, and take place about the end of summer. Common, and often found with the animal, in crab-boats. Cornish specimens are usually smaller than those farther east.

#### *CEPHALOPODA.*

##### *POLYTHALAMOUS CEPHALOPODA.*

The shell many chambered, more or less enveloped, placed on the hinder part of the body of the animal, often adhering.

#### FIRST DIVISION.

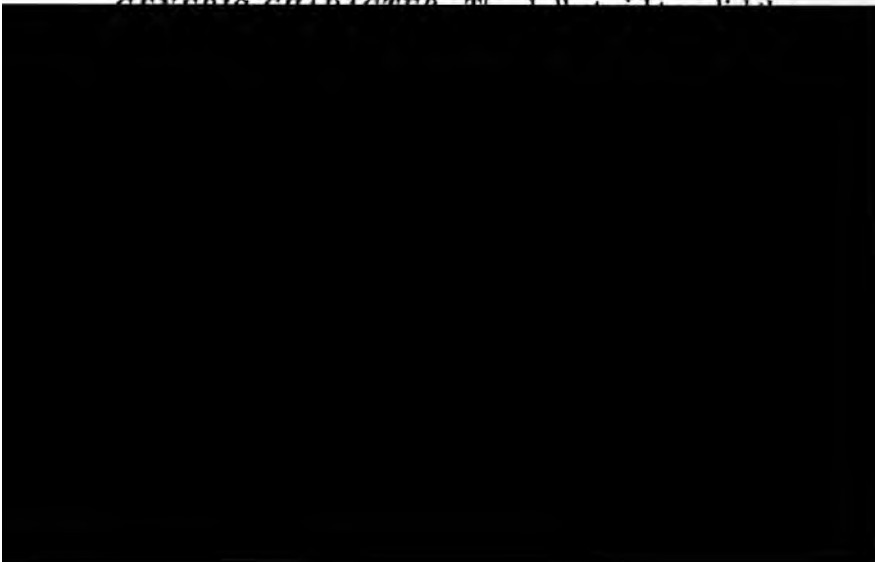
The shell many chambered, the partitions simple; not showing any divided sinuous sutures on the inner surface of the shell.

##### *ORTHOCERATA.*

The shell straight or nearly so; not spiral.

##### *ORTHOCERA.*

GENERAL CHARACTER. The shell is straight, and is



## SPIRULA.

**GENERIC CHARACTER:** The shell cylindrical, thin, nearly transparent, many chambered, partly turned into a discoidal spiral form; the whorls separate, the last produced in a straight line. Partitions transverse, equally distant, externally concave; syphon lateral, interrupted; aperture round.

- \* **S. AUSTRALIS.** Nautilus Sp. Turt. Lin. Sp. A. Flem. Brit. An., p. 227. Crouch's Intro., pl. 20, fig. 7. According to Dr. Fleming, two specimens only of this shell are recorded as British; having been found on the coast of Ireland. I have been informed of several, taken on the coast of Cornwall, and three specimens have come into my possession, that were found within a mile of my own residence; but they were destitute of an inhabitant, and one is shewn to have been for some length of time dead, by having attached to it the shell of a small Spirorbis. They were probably floated to us in the same manner as the *Ianthina*, as before noticed; and whether the animal has lived in our waters is still a matter of doubt.

THE SECOND DIVISION includes no British Shell.

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 APPENDIX.
 

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*REPORT on the Zoology of the County of Cornwall, presented (with some alteration) to the Meeting of the British Association of Science, at Plymouth, in the year 1841, forming an appendix to the preceding Fauna.*

The Report of the Zoology of the County of Cornwall now presented to the British Association of Science, is designed to afford a summary of the species, chiefly of the Vertebrate, Radiate and Testaceous classes, with the stalk eyed genera of Crustaceans, and so many of the Zoophytes as have been recognized by naturalists; reserving for further consideration the species concerning which there is any doubt. It is intended also to comprize such as have been discovered since the publication of the former portion of the Cornish Fauna.

Of the fourteen or fifteen species of Cheiroptera (Bats) enumerated as British by Mr. Bell, six are included in the Cornish Fauna; and one more (*Vespertilio Discolor*) has been found at no greater distance than Plymouth. Of the remainder, eight are too limited, in numbers and distribution,

to enter into a calculation of comparison with other parts of the kingdom. The commonest of the Cornish Bats are, the Pipistrell, Lesser Horse-shoe and Long-eared, in the order in which they are enumerated; but their local occurrence depends more on the accident of their meeting with congenial haunts, than on the mere influence of climate. The latter circumstance, however, produces its effect on the habits of these animals; so that in Cornwall, where what may be denominated severely cold winters do not occur more frequently than in cycles of six or eight years, the appearance of the Bat may be witnessed in every week, in an ordinary year. A fall below the 40th degree of the thermometer is the signal for their retreat; but a slight change to a milder temperature restores them to activity, when not uncommonly they may be seen at mid-day, in search of prey, which might not be obtained at the more usual hours of the evening.

It may be regarded as another proof of the mildness of the climate, that the Longtailed Field Mouse (*Mus Sylvaticus*) breeds at, or even before, the beginning of January; forming its nest at this time in ricks of hay. The Frog also is rarely later than this period in depositing its spawn.

Of the genus *Sorex*, Cornwall possesses three species, sufficiently distinguished. These are, *Sorex Araneus*, *Jenyns in the Magazine of Zoology, vol. 2*: the front teeth a deep brown through most of their length: *Bell's British Quadrupeds, p. 109*. Another species, *S. Araneus* of *Duvernoy and Jenyns Mag. of Zo., vol. 2, fig. 1*, the snout not so long as in the *S. Araneus* of English Authors: the body and tail longer; ears and tail different, the former being more membranous, and very slightly furred; the teeth brown only at the tips of the lower front teeth; and so generally of the

gentleman has informed me that within his knowledge, the skull of this animal, with the horns affixed to it, was found at the depth from the surface of sixty feet, in the Porth Mining works, near Fowey. The horns were of large size, and much projecting forward, as in the Leicester breed of cattle; they belonged to one which, from his judgement of the modern ox, might weigh 1000 pounds. In the collection of the Royal Geological Society at Penzance is a portion of the Humerus of what appears to have been the same animal, the circumference of the shaft of which measures twelve inches.

Of Birds 230 species are reported in the Cornish Fauna, to which the following must now be added.

**HONEY BUZZARD.** *Buteo Apivorus* Yarrel's Brit. B., vol. 1, p. 85. A bird of the first year, killed in Cornwall, fell into the hands of Dr. Leach, and is now in the

British Museum. *Mag. Nat. Hist. N. S.*, vol. 1, p. 539.

**SNOWY OWL.** *Strix Nyctea*. Yar. Brit. B., vol. 1, p. 134. Its occurrence in Cornwall is reported by Mr. Bellamy, *Nat. Hist. of south Devon*, p. 200. The specimen is in the possession of the Reverend Mr. Hore, where I had an opportunity of inspecting it. It had probably been driven hither by a storm, having suffered much from the weather.

**WOOD SHRIKE.** *Lanius Rutilus*. Yar. Brit. B., vol. 1, p. 160. Reported by Mr. Rodd, of Penzance.

**BLACK START.** *Phænicura Tithys*. Yar. Brit. B., vol. 1, p. 241. Reported by Mr. Rodd.

**GREY HEADED WAGTAIL.** *Motacilla Neglecta*. Yar. Brit. B., vol. 1, p. 375. *Mag. Nat. Hist., N. S.*, vol. 3, p. 467.

**WHITE CROSBILL.** *Loxia Falcistrostra*. Yar. Brit. B., vol. 2, p. 38. Reported by Mr. Rodd.

**ROSE COLOURED PASTOR.** *Pastor Roseus*. Yar. Brit. B., vol. p. 51. Reported by Mr. Rodd, and Mr. Mitchell.

**THE MAWMET PIGEON.** *Columba Turcica*. Reported in the *Cornwall Gazette*, as killed at St. Enoder in August 1840; it may probably be no other than a variety of the Common Pigeon: the specimen escaped from confinement.

**NIGHT HERON.** *Ardea Nycticorax*. Yar. Brit. B., vol. 2, p. 485. Specimens of the male and female and young bird in nestling plumage have been obtained by Mr. Rodd. The male was killed at Crowan; the female at or near the Lizard; the young one was caught alive near Newlyn, and appeared to answer in every respect to the Gardenian Heron of authors. Mr. Rodd, report of the Royal Institution of Cornwall, 1839, p. 39.



**DOTTEREL.** *Charadrius Morinellus*. Yar. Brit. B., vol. 2, p. 392.

**SPOTTED REDSHANK.** *Totanus Fuscus*. Yar, Brit. B., vol. 2, p. 520. Reported by Mr. Rodd.

**WOOD SANDPIPER.** *T. Glareola*. Yar. Brit. B., vol. 2, p. 534. Reported by Mr. Rodd.

**PECTORAL SANDPIPER.** *Tringa Pectoralis*. Yar. Brit. B., vol. 2, p. 654. By Mr. Mitchell.

**EIDER DUCK.** *Anas Mollissima*. A female shot on the Looe River, Christmas, 1839.

**LONGTAILED DUCK.** *Harelda Glacialis*. A female taken at Penzance, by Mr. Mitchell. *West Briton*, April, 1840.

**ICELAND GULL.** *Larus Islandicus*. Obtained at Hayle in 1840.

**WILSON'S PETREL.** *Procellaria Wilsoni*. An account of the first specimen of this bird taken in the British Islands, and which came into my possession, was communicated to the Linnean society; and is published in the 18th vol., of its Transactions, p. 688. The specimen itself has been submitted to Mr. Yarrell's inspection.

The number of Fishes reported in the Cornish Fauna amounts to 167 species: to which the following are now to be added:

**LITTLE WIEVER.** *Trachinus Vipera*. Yar. Brit. F., vol. 1, p. 25.

**MALARMATE.** *Peristedion Malarmat*. Yar. Brit. F. Sup., p. 10. I am informed by Mr. Peach that two specimens were caught near Gorran, in 1838.

**PALM CRESTED BLENNY.** *Blennius Palmicornis*. Yar. Brit. F. vol. 1, p. 283. *B. Yarrellii Valenciennes*.

fishes have abounded in countless myriads, in a manner never remembered by fishermen. All of them were of about one size, 14 or 15 inches in length. They kept at the surface over a depth of 20 or 30 fathoms, and were much preyed on by other fishes. I was much amused by the actions of one that had been left in a deep pool by the receding tide; which actions are descriptive of the mode by which they contrive to suspend themselves at the surface. It laid hold, by its tail, of a piece of loose and slender seaweed, somewhat lighter than the specific gravity of its own body; and assuming the attitude corresponding to that represented in the vignette to Mr. Yarrell's account of the Hippocampi, it steered the seaweed about at pleasure, by the action of its dorsal-fin; the posterior portion of its body being twisted round the weed, the anterior erect and free.

**SPINOUS SHARK.** *Squalus Spinosus.* Yar. Brit. F. Sup., p. 54.

Of stalked eyed Crustaceans the Cornish Fauna reports 67 species; to which one or two more will be added, when their synonyms are placed beyond doubt. It may be proper to remark, that *Platyonichus Plicatus* (M. Edwards' Crust., vol. 1, p. 442,) has been confounded with the small specimens of more than one kindred species; from which it is not easily distinguished, except by comparing them together. In habits however, it differs considerably; living in deep water on the surface of which it swims in pursuit of prey. In this respect it imitates the Nipper Crab (*Polybius Henslowii*); and though so much less in size, with scarcely less powers.

Of Testaceous Mollusks an enumeration is given in the second part of the Cornish Fauna, and it is probable that further research will bring to light many hitherto unknown species. The following additions and remarks are added by way of supplement to the preceeding account of the shells:

**SERPULA FILOGRANA.** This curious mass of interwoven tubes might readily be mistaken for a coral of the Genus *Tubulipora*; but that the animal is of the class which forms the tubes of the *Serpulaceæ*, has been shown in the Zoological Journal, by Mr. Berkely. The shell are closely and somewhat regularly interwoven, many thousands together, forming a mass with many crevices and meshes: the progress of the growth of which must afford an interesting subject of enquiry. My only specimen was thrown on shore in St. Austle-bay.

**VERMILIA CORONATA.** Length less than an inch, of the size of a small pin; about a fourth of the length erect, round; the orifice having fixed on it a coronet having six prominent equal sized teeth, placed at regular intervals, and diverging straight from the rim. Colour pale yellow.

On a stone taken up by a fisherman's hook from deep water. It seems to be unknown, and I have therefore given it the name as above.

The Serpulaceæ appear to be of rapid growth, and at first to be destitute of a shell. I have seen specimens of an Heteroclite species, probably *Spirorbis Heteroclita*, with the newly formed shell, though of full size, so transparent, that the fine vessels and fibrils of the animal might be examined through its substance.

**BALANUS RUGOSUS.** Mont. Test. Brit., vol. 1, p. 8.

Scarcely uncommon, though local.

A question of doubt (?) should be added to *Tubicinella Clavata*.

**ANATIFERA FASCICULARIS.** After a storm in October, 1841, I found on the beach a small empty phial bottle, with this barnacle attached to its neck; and Mr. Peach informs me that numerous feathers of a bird were at the same time washed on shore, having attached to them, specimens of *A. Fascicularis* and *A. Sulcata*: proofs of the fact that these rare species are capable of attaching themselves to substances which have never been deeply immersed. The first named of these species though commonly appearing almost sessile, is capable of elongating its pedicle to about the length of the shell, and of moving it in various directions.

**A. ANSERIFERA.** Mr. Peach found this species attached to a stem of sea-weed, contrary to its usual habit.

**ARCA RHOMBEA.** Cornish Fauna, Shells, p. 31. This seems to be *A. Tetragona* of Mr. Forbes, *Fauna Monensis*, p. 41, and pl. 3, where it is represented as covered thickly with hairs. The operculum is also stated not to

**ASTERIAS AURANTIACA.** Forbes, p. 130. It is so rare that I had never seen a specimen, until at the Meeting of the British Association for science, Mr. J. C. Bellamy produced one taken in Whitsand-bay. It is common in Plymouth-sound; and I obtained a few specimens from the Breakwater.

**OPHIURA BRACHIATA,** must be omitted, until discovered anew.

The following are ascertained Cornish species of *Holothuriadæ*:

**CUCUMARIA PENTACTES.** Forbes, p. 213.

**SYRINX NUDUS.** Forbes, p. 245.

**SIPUNCULUS BERNARDI.** Forbes, p. 251.

**THALASSIMA NEPTUNI.** Forbes, p. 259. A species of common occurrence from deep water, inhabiting perforations of stone, which it enters apparently for the purpose of devouring the animal of the shell-fish within. Species remaining for examination are chiefly of the genus *Cucumaria*; together with one closely allied to the genus *Psolus* of Mr. Forbes. A notice of it was sent to that Gentleman, but too late for publication in his history of this family. It was judged by him to be worthy of generic distinction, which is thus marked: under surface extending through the length, and covered with thickly set suckers, not in distinct rows. Upper surface covered with tubercles, each with an orifice, from which at will is protruded a cartilaginous point. Tentacula at the end 18, with club-shaped foliations on slender stalks.

The specimen was about six inches long, and of the size of an ordinary mould candle. Upper surface dark blue; centre of each tubercle light, enclosing a dark point, and round the whole a light purple ring. After death these tubercles sunk and disappeared; so that without pressure they could scarcely be perceived. At that end of the animal opposite the tentacula is an orifice, with a small blunt protruding process; which seems in constant, though slow, action, producing a slight eddy in the water. When alive this creature had a line along its dorsal surface, narrow but free of tubercles; and something similar but shorter, on each side; both disappearing when the animal contracted, and after death. If it be allowed that this creature is entitled to form the type of a new genus, I would propose for it the name of *Forbsia*, in honour of the Natural Historian of the British Echinodermata.

In this place I would insert an account of an animal, of which a figure was submitted to the inspection of the most eminent Naturalists and comparative Anatomists, at the

meeting of the British Association; but concerning which the only conclusion definitely formed was, that the species, and perhaps the genus, was new to Britain, if not to science. It consisted of an oblong mass ten inches in length, seven wide, and about three in thickness, the weight three ounces less than three pounds. The under surface, by a portion of which it had been attached to a solid body, was flat and bare, and of the whole breadth of the animal; but it was not quite the whole length. At the end which I would designate the anterior, was a wide and somewhat deep cavity, but not leading to any organization within; and it is at this part that the flat under surface does not quite reach the extremity. At the left side (counting the anterior end as front) a void space for two thirds of the length, bare and rigid, and on its upper portion an orifice; another in a depression about the middle of the upper surface: the direction running toward one side. Round the margin of the under surface, and irregularly placed on the upper, are a number of lumps or broad tubercles, which are covered and encircled with flaccid processes, that are most numerous on the anterior end. They vary in length from a quarter of an inch to an inch, and a few are bifurcate. If there be any orifice to these processes, it is minute; but the process is wide, flat, and flaccid; and each has a light coloured vessel, or intestine having yellow or brown contents; and a row of white thick set dots on each side. Colour a leek-green, except the processes, which therefore appear conspicuous. This description conveys the idea of an animal of the class Ascidia, and differing from the ordinary form of the known species only in the existence of organized processes. But dissection proves it to belong to a very different genus of the Cuvierian order Acalepha.

was a small cavity, in which was a gelatinous globule, that escaped on being touched. I suppose it to have been an ovum. One of the most eminent comparative anatomists of the age was inclined to refer this animal either to the genus *Botryllus* or *Polyclinum*: I think most probably the latter.

### SUMMARY OF CORNISH ZOOPHYTES :

*The ascertained Species compared with the British List contained in the Work on the subject by Dr. George Johnston.*

|                               | BRITISH SPECIES. | CORNISH.   |
|-------------------------------|------------------|--|
| <b>HYDROIDÆ</b> . . . . .     | 50 . . .         | 40   |
| Hydra . . . . .               | 5 . . .          | 0  |
| Tubulariæ . . . . .           | 6 . . .          | 6  |
| Coryne . . . . .              | 1 . . .          | 1  |
| Hermia . . . . .              | 1 . . .          | 1  |
| Tubularia . . . . .           | 4 . . .          | 4  |
| Sertulariæ . . . . .          | 39 . . .         | 34   |
| Thoa . . . . .                | 3 . . .          | 3  |
| Sertularia . . . . .          | 16 . . .         | 13   |
| Thuiaria . . . . .            | 2 . . .          | 2  |
| Antennularia . . . . .        | 1 . . .          | 1 and one supposed distinct.   |
| Plumularia . . . . .          | 8 . . .          | 8 and one not noticed by Johnston.   |
| Laomedea . . . . .            | 3 . . .          | 3  |
| Campanularia . . . . .        | 4 . . .          | 4  |
| Cymodocea . . . . .           | 2 . . .          | 1  |
| <b>ASTEROIDÆ</b> . . . . .    | 9 . . .          | 5  |
| Pennatulidæ . . . . .         | 3 . . .          | 0  |
| Gorgoniadæ . . . . .          | 4 . . .          | 3  |
| Gorgonia . . . . .            | 4 . . .          | 3 { of G. Placomus found in Corn-<br>wall by Ellis, and G. Flabellum,<br>by Borlase, no specimens have<br>been since seen. |
| Alcyonidæ . . . . .           | 2 . . .          | 2  |
| Alcyonium . . . . .           | 1 . . .          | 1  |
| Cydonium . . . . .            | 1 . . .          | 1  |
| <b>HELIANTHOIDÆ</b> . . . . . | 13 . . .         | 7  |
| Madrephylliæ . . . . .        | 2 . . .          | 1  |
| Caryophyllia . . . . .        | 1 . . .          | 1  |
| Turbinolia . . . . .          | 1 . . .          | 0  |
| Actiniadæ . . . . .           | 11 . . .         | 6  |
| Actinia . . . . .             | 6 . . .          | 4 and one not noticed by Johnston.   |
| Anthea . . . . .              | 2 . . .          | 1  |
| Lucernaria . . . . .          | 3 . . .          | 1 { which resembles L. Auricula,<br>but may perhaps prove distinct.  |
| <b>ASCIDORÆ</b> . . . . .     | 64 . . .         | 44   |
| Vesiculariæ . . . . .         | 8 . . .          | 4  |
| Vesicularia . . . . .         | 1 . . .          | 1  |
| Serialeria . . . . .          | 1 . . .          | 1  |
| Valkeria . . . . .            | 4 . . .          | 3  |
| Bowerbankia . . . . .         | 2 . . .          | 0  |

|                             |    | BRITISH. |    | CORNISH.                         |  |
|-----------------------------|----|----------|----|----------------------------------|--|
| ASCIDOIDÆ, (continued.)     |    |          |    |                                  |  |
| Crisiadae . . . .           | 10 | . .      | 8  |                                  |  |
| <i>Crisia</i> . . . .       | 5  | . .      | 4  |                                  |  |
| <i>Notamia</i> . . . .      | 2  | . .      | 1  |                                  |  |
| <i>Anguinaria</i> . . . .   | 1  | . .      | 1  |                                  |  |
| <i>Hippothoa</i> . . . .    | 2  | . .      | 2  |                                  |  |
| Tubuliporidae . . . .       | 5  | . .      | 4  |                                  |  |
| <i>Tubulipora</i> . . . .   | 4  | . .      | 3  | and two not noticed by Johnston. |  |
| <i>Discopora</i> . . . .    | 1  | . .      | 1  |                                  |  |
| Celleporidae . . . .        | 14 | . .      | 11 |                                  |  |
| <i>Cellepora</i> . . . .    | 5  | . .      | 5  |                                  |  |
| <i>Lepralia</i> . . . .     | 7  | . .      | 5  |                                  |  |
| <i>Membranipora</i> . . . . | 2  | . .      | 1  | and one new.                     |  |
| Escharidae . . . .          | 23 | . .      | 13 |                                  |  |
| <i>Flustra</i> . . . .      | 11 | . .      | 6  | and one not noticed by Johnston. |  |
| <i>Cellularia</i> . . . .   | 5  | . .      | 4  |                                  |  |
| <i>Acamarchis</i> . . . .   | 2  | . .      | 0  |                                  |  |
| <i>Farcimia</i> . . . .     | 1  | . .      | 1  |                                  |  |
| <i>Ratepora</i> . . . .     | 2  | . .      | 1  |                                  |  |
| <i>Eschava</i> . . . .      | 2  | . .      | 1  |                                  |  |
| Alcyonidulæ . . . .         | 5  | . .      | 4  |                                  |  |
| <i>Alcyonidium</i> . . . .  | 4  | . .      | 3  | and one not noticed by Johnston. |  |
| <i>Cliona</i> . . . .       | 1  | . .      | 1  |                                  |  |
| CALCAREOUS CORALLINES       |    |          |    |                                  |  |
| <i>Millepora</i> . . . .    | 2  | . .      | 2  |                                  |  |
| <i>Iania</i> . . . .        | 2  | . .      | 2  |                                  |  |
| <i>Corallina</i> . . . .    | 2  | . .      | 2  |                                  |  |

Several species are confounded with each of the kinds included in these Genera of Calcareous Corallines.

A  
**CORNISH FAUNA;**  
BEING A COMPENDIUM  
OF THE  
**NATURAL HISTORY**  
OF  
**THE COUNTY,**

*Intended to form a Companion to the Collection in the Museum of the Royal  
Institution of Cornwall.*

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**PART III.**

containing

**THE ZOOPHYTES AND CALCAREOUS CORALLINES.**



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**By RICHARD Q. COUCH, M.R.C.S.L.**

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**TRURO :**

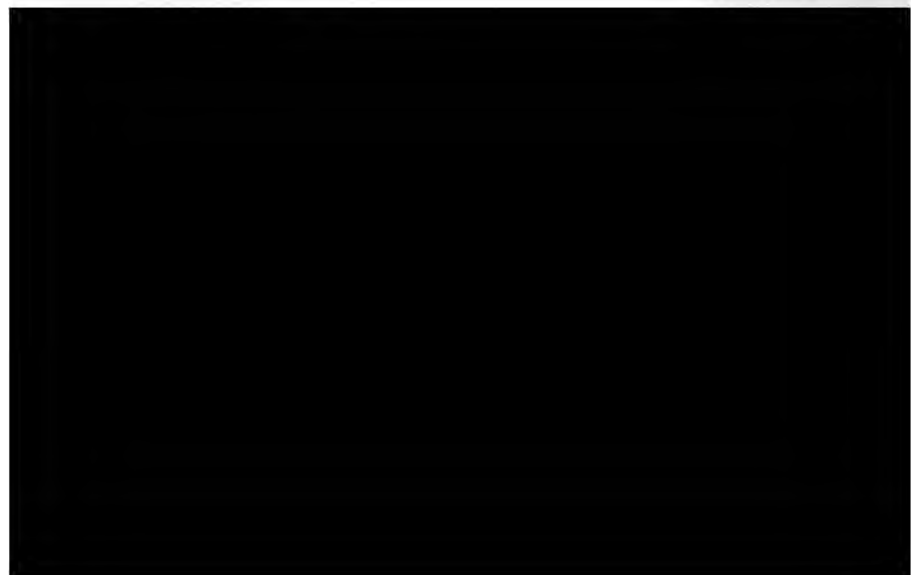
*Printed for the Royal Institution of Cornwall,*

**By L. E. GILLET.**

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**1844.**






## PREFACE.

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It would be but an idle employment of time to expatiate on the pleasures of the study of nature, since they must be obvious to all. To view her boundless diversity of forms and gradations; to become acquainted, in fact, with creation is to be enamoured of her charms. Her productions are every where to be found, and every where inviting attention; they are so many and so various, the laws by which she governs them so extensive and beautiful, that none of her followers ever yet complained of satiety or disgust; on the contrary, to investigate her works gives health to the body, vigour, to the mind, and yields an inexhaustable fund of amusement and delight. As it neither requires confinement, sedentary habits nor expensive instruments to study it with success, it may be pursued by the poor as well as the rich.

But as the productions of nature are so very extensive and diversified, it has been found necessary, for the conveniency of study, to divide and arrange them into small departments. The advantages of this must be ob-

vious ; students generally confine their attention to one or more divisions, each thereby becomes more thoroughly investigated and the whole better understood. Some departments, however, either from their brilliancy or easiness of access, have always been greater favourites and have had more cultivators than others. In this country, Birds and Insects have had, with the exception of Botany, more followers than all the others together, while the Zoophytes have suffered a very general neglect. In the following pages an attempt is made to rescue them from this obscurity, or such of them as are found upon the Cornish coast ; they are, it is true, very unobtrusive, and compared with similar productions from warmer seas, insignificant ; yet they are interesting, as being our representatives of creatures which have acted and are still acting, an important part in the mutations of the earth's surface.




in procuring specimens from a variety of localities, that they might be examined under a variety of circumstances, and their true character more satisfactorily ascertained. The materials thus accumulated would never have taken any other form than papers to different societies, had it not been thought desirable to have a Cornish Fauna as perfect as the present state of our knowledge would allow.

The importance of local Faunas is too generally allowed to require any advocacy now. By the investigation of circumscribed localities, the habits and economy of animated nature are more minutely observed and better understood than when studied in the mass. The same animals being found in different parts of the world, they are thus examined under such a variety of circumstances, that we become more intimately acquainted with them. It should always be remembered that neither Beasts, Birds, Fishes, nor any other animals, are scattered indiscriminately through the earth, but are confined in groups to particular zones of climate; and nature beautifully adapts her productions to the situations they are destined to occupy.

The migration of animals, which has hitherto baffled the researches of naturalists, will probably receive its elucidation from these local registers. If after repeated observation it be found that certain creatures periodically visit and leave certain regions, it seems the most

rational to suppose that an explanation is to be found, either in the condition of the earth's surface, climate or change of the seasons, the supply of food, or some other cause depending on local peculiarities.

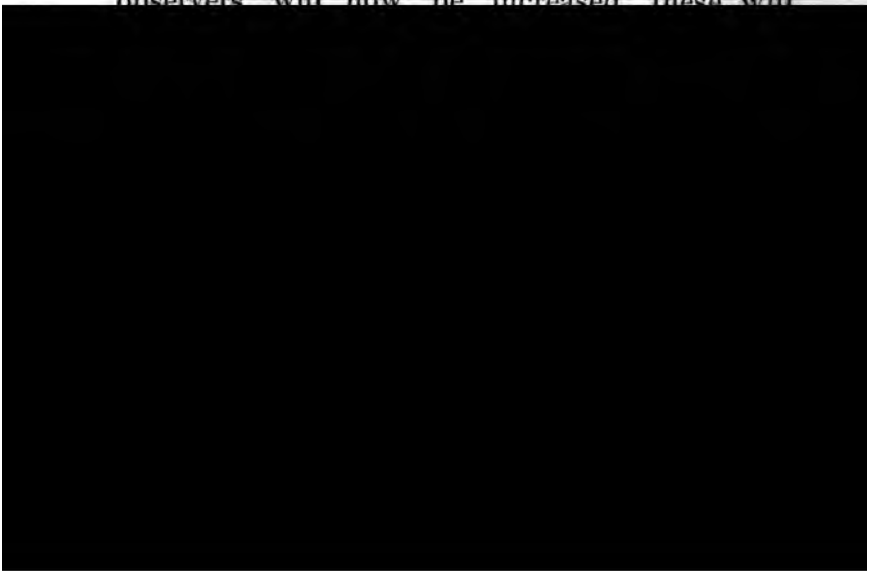
It is by these local Faunas that the Geographical distribution of animals has been of late so successfully cultivated, and a few of the laws which govern them ascertained. It has been found that similar climates however widely separated from each other, are inhabited by similar animals, or animals of similar habits. Thus it is that the Himalaya mountains of Asia, which rise from the plains of the torrid zone through every belt of climate, to regions of perpetual snow, have representatives of almost every living class of creatures. This is of course considerably modified by the character of the surrounding country. If the zones of climate follow closely on each other, each becomes variegated by the encroachments of the productions



The knowledge of the distribution of animals may be of importance in another point of view, as affording collateral assistance to the Geologist in determining the character of the mutations of the earth. For as at the present time similar climates, however distant, however much isolated from each other, are peopled by similar creatures, so probably it has ever been; and this would seem to point to a period or periods when they were universally diffused: a diffusion which subsequent geological changes have very remarkably deranged. If all animated creation ever existed at any one epoch, the climate and condition of the earth's surface must have been so peculiar, that we can form no idea of them at the present time. While the geologists thus look to Natural History for assistance in solving some of their obscure problems, the Naturalists must in turn look to Geology for assistance in deciphering the system which nature has followed in forming her productions. In the existing races of beings there are many wide chasms which divide creation into irregular masses, which have hitherto defied all attempts at successful classification. But geologists are daily discovering extinct forms, which are filling up the vacancies, and which eventually may unite creation into an harmonious whole.

The Zoophytes at present existing on our shores are small and fragile when compared

with those of warmer climates; yet the limestone of Devon and the slate rocks of Cornwall contain the remains of specimens, which for size and beauty might have vied with any now existing. Though the Cornish species are small, yet many of them are exceedingly elegant, and seem peculiarly fitted to invite attention. To myself the investigation it has been rather the amusement of leisure hours and pleasurable excursions on the water, than a study; had it however, been otherwise the pleasure derived from it would more than have compensated for any difficulties that could have occurred. It has been a source of health, innocent amusement and pleasure, and will be so to all who study nature where she is to be found; abroad rather than in the closet. As Cornwall, from its form has a very great extent of sea coast, some species have probably escaped detection; but as it is to be hoped that the number of observers will now be increased, these will



## INTRODUCTION.

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THE general form of most of the Zoophytes found in the British seas so exactly resembles that of plants, that it cannot be a matter of surprise that they were formerly thought to be marine vegetables. Even at the present time, when their natures are so well understood, the idea of vegetability is always associated with their appearances; and to a person not previously acquainted with the subject, the calling them animals would be revolutionizing all preconceived opinions; yet animals they unquestionably are. The first person who distinctly advocated this view of the question was Peyssonnel; his communications, however, to the Academy of Paris were received with so much distrust, that the Society never thought them worthy a place in their Transactions; and Reaumur, who read them, even deemed it necessary to conceal the author's name to shield him from that ridicule and contempt which such opinions were thought likely to create.\* Under such circumstances, Peyssonnel's views lay for a long time neglected, and were finally forgotten. After a considerable lapse of time, Trembly brought back the attention of natura-

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\* He communicated his views to the French Academy in 1727, and they lay neglected till 1756, when, highly displeased with that body, he published them in the Transactions of the Royal Society.—*Traité du Corail*.



lists to the subject by the publication of his remarkable experiments on the fresh water polypes; then Reaumur, recollecting Peyssonnel's papers, examined the subject for himself, and to compensate for his former caution advocated them with boldness. But though he did it with great eloquence and ability, yet they were considered so extraordinary that they again sunk into oblivion, till Ellis, with the hand of a master brought the whole subject clearly and convincingly to light. Ellis after a great deal of research and patient investigation, published his celebrated "Essay on Corallines," in which he placed their animal characters on so firm a foundation, that they have ever since withstood the power of all assailants. He met, however, with opposition as powerful as it was fruitless; for though all the most eminent men of his day opposed him, yet his superior knowledge of the subject placed them entirely within his power. The most influential of those who differed from him was Linnæus, who at that time was in the zenith of his fame, and from whose decision there was no appeal; yet from Ellis' reasonings, he altered his opinions several times. He at first considered them to be purely

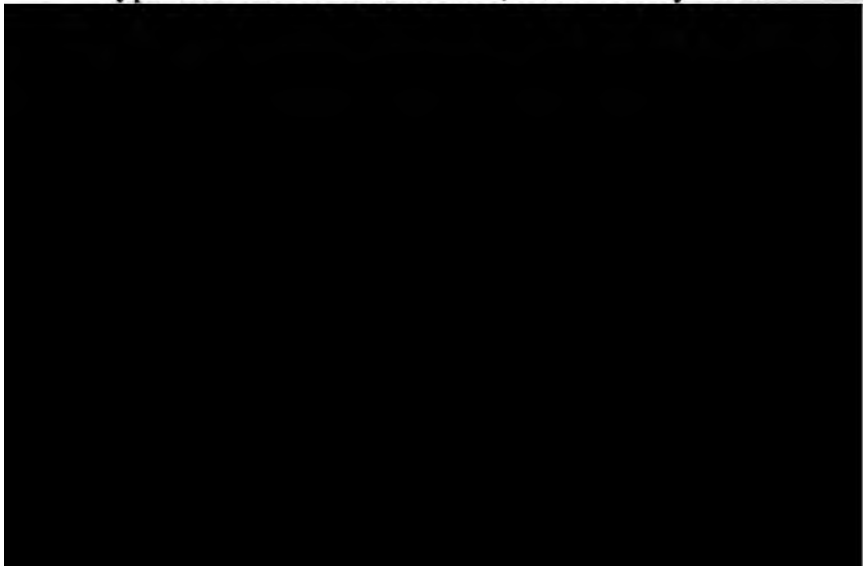


by pores, not by roots, as we learn from Fuci. As Zoophytes, are, many of them covered with a stony coat, the Creator has been pleased that they should receive nourishment by their naked flowers. He has furnished each with a pore, which we call a mouth. All living beings enjoy some motion. The Zoophytes mostly live in the perfectly undisturbed abyss of the ocean, they cannot therefore partake of that motion which trees and herbs receive from the agitation of the air. Hence the Creator has granted them a nervous system, that they may spontaneously move at pleasure." Ellis, however, was not to be shaken, he still retained his previous opinions, which, with the exception of those on the calcareous Corallines, are those now received as true. As these points will be considered when the different orders pass in review, it will not be necessary particularly to notice them here; but a careful examination of the observations scattered through the following pages will certainly convince the student of the truth of Ellis' views, however plant-like the productions may seem.

The system of arrangement which has been followed is the one proposed by Dr. G. Johnston in his work on British Zoophytes. In principle it is certainly more natural than any hitherto proposed, though it is open to a few objections. By making a *polype* to be an essential character of the *Class*, it thereby excludes some animals of still lower station, which by former Authors were united together. In the systems of Linnæus, Cuvier and many others the calcareous Corallines and Sponges are arranged with the true Corals, but in Johnston's they are excluded. The calcareous Corallines are, however, now generally admitted to be purely vegetable; but though of late, some doubt has been expressed about the

animal nature of the sponges there are sufficient grounds for considering them animals and as belonging to this class, and they are omitted here only from a desire of further investigation.


The British polypous Zoophytes naturally divide themselves into two grand divisions or sub-classes; the first embraces the radiated form, in which the body is contractile in every part with but a single aperture. This division contains three minor ones, or orders, the *Hydroidea*, *Asteroida*, and *Helianthoida*. The second division contains the *Molluscan Zoophytes*, in which the body is non-contractile, non-symmetrical, with two apertures. It has only one order, the *Ascidioidea* which is very closely allied to the *Mollusca tunicata*. In the *Hydroidea* the tentacula are tuberculated, and the stomach a mere depression made in the granular mass without any particular organization, and the horny sheath which is not found in all the genera, is external. In the *Asteroida*, the tentacula are eight in number and fringed; the solid parts when present, are all internal; and the external surface is always marked with eight rayed depressions. The *Helianthoid* having for its type the common *Anemone*, need hardly be re-



enclosed in horny or calcareous cases, yet they do not grow indiscriminately in any situation, but exercise a faculty of selection. This is very different from the selection of soils by plants, which imbibe their nourishment through their roots; for though rooted, all nourishment in these creatures is taken through the polype mouths. Among the *Hydroïda* the Sea Beard, (*Antennularia antennina*) prefers oysters and other bivalves, but is also found on stones and sand; the form of the whole varying according to the locality. The Sea Oak, (*Sertularia pumila*) prefers the fronds of fuci growing near the tide marks, or the declivities of rocks in sheltered situations; the Sea Threads, the fronds of the larger fuci and the margins of pools, but they have been found abundantly on the fins of a shark; the Sea Bristles, dead muscle shells and horny corallines. This is the case also with the Sea Anemonies, but as they are naked and locomotive it is not so much a matter of surprise. Some species prefer one locality, and others another; some the smaller fuci, and others the larger; but the situations sometimes selected are exceedingly curious; thus the small climbing Coralline (*Campanularia volubilis*,) has a predilection for the antennæ of crabs, where it can enjoy the advantages of locomotion in catching its prey.

This power of selection is also to be found in the Ascidian Zoophytes; thus the *Flustra lineata* prefers flat stones between tide marks, while the *Membranipora Peachii* most commonly selects a dead muscle valve and sometimes the dead oyster and great Pinna; the purple Tubulipora (*T. Serpens*) prefers corallines, while the Sea Mat (*Flustra membranacea*) always encrusts the frond of the great sea weed (*Laminaria digi-*

*tata*.) This is the case with all and their peculiar habitats will be noticed when speaking of each species. This selection of situations, however is a physiological one, rather than one which may be supposed to be the result of any intelligence in the animals themselves. For in the same situations of climate and depth of water, the same species will frequently grow on any substances provided there are similarities of surface. This is however considerably modified by collateral circumstances, such as the power to absorb and radiate heat and the durability of the substances on which they grow. Thus for instance the *Caryophyllia Smithii* most commonly selects for itself the moderately rough surfaces of stones, yet it has been repeatedly found in a young state on the lobes of *Alcyonium digitatum*, and on the stems of fuci, but in such situations it never attains a full size. The young of all the species will take root and grow for a short time, in situations which afterwards appear to be destructive to them. Those ova therefore which fix themselves in unfavourable situations perish, while others more favourably situated thrive and grow to perfection; but still it remains a matter for speculation, why one kind of locality should



elevations, effected posterior to their formation. The experience derived from observations made on the Cornish Coast, can of course be but of little value, either as contradictory or confirmatory of such an opinion; yet it is proper to state that Zoophytes of all the orders to be described in the following pages have been procured from about sixty fathoms water. Though they, therefore, may not extend to any great depth, yet they are certainly not confined to thirty fathoms of water as has been supposed. Algæ, however, are never found on the stones drawn from more than twenty five fathoms, on any part of our coast.

In the following pages the term *polypidom* is very frequently used, but it is synonymous with *polypier* of continental Naturalists, and as only a convenient mode of expression for the solid parts of Zoophytes, such for instance as the horny parts of *Sertulariæ* and the solid axis of *Gorgonia*; beside this, no terms are used, which require any explanation.



# CORNISH FAUNA.



## CORNISH ZOOPHYTES.

### SUB CLASS I.

#### RADIATED ZOOPHYTES.

Body contractile in every part, symmetrical; mouth and anus one; gemmiparous and oviparous.

#### ORDER I.

##### HYDROIDA.

This, the first order of Zoophytes, is very commonly distributed on all parts of our coast from the tide marks to mid-channel; and the individual species are of such delicate and elegant shapes, as seem peculiarly fitted to invite attention and study. The outward forms vary from a single stem to the bushy appearance of the Ostrich feather or the Squirrel's tail; and the examination of their minute structure and economy shows an equal variation which adds greatly to the pleasure of their study. The arrangement followed in this essay, is based on the character of the animal or polype and is in some measure independent of the form and character of the hard parts or polypidom. Its character is: "*Polypes compound, rarely single and naked, the mouth encircled with roughish filiform tentacula; stomach without proper parietes: intestine none; anus none; reproductive gemmules pullulating from the body, and naked or contained in external vesicles. Polypidoms horny, fistular, more or less phytoidal, fixed, external.*" When the polypidom is present, it is always external and horny; but there are several species belonging to it which have none; and these are called *Naked Hydroida*. Of the naked species, which inhabit fresh water, I have hitherto found none in Cornwall; though probably a more extended search may be successful, as the *Hydra viridis* has been found in Devon by Turton.

It was on these naked creatures that Trembly made his remarkable experiments, by which it was proved that they



are so tenacious of life, as to be incapable of destruction by mutilation. When a head is severed from a body, the latter acquires a new head, and the head a new body. The head, or even the whole body, of one may be grafted on the body of another; or they may be divided into a multitude of parts and each will become a new body and a perfect animal. They may even be turned inside out, or slit up and extended as a membrane, without much apparent injury.

Per damna, per cædes, ab ipso  
Ducit opes animumque ferro.

When these experiments were first made public, they excited, as they well might, the wonder of the world, nor do they now cease to astonish us, though made familiar by finding a place in most elementary works on Natural History and Natural Theology. Though the polypes of the sheathed or horny genera are incapable of undergoing such remarkable changes, yet the same disposition pervades the whole order. If for instance, the Sea Oak (*Sertularia pumila*) or the Great-tooth Coralline (*S. polyzonias*) be allowed to remain in impure water for a few days, their heads and tentacula will frequently drop off and the polypes shrink into the cells; but, afterwards if the water be frequently renewed, a new head and tentacula will soon be formed. At first the new parts differ in colour from the older portions, but this difference in a very short time is entirely lost, although the new tentacula are rarely equal in number to the old ones: a circumstance that explains the variety assigned by different authors to the same species. In the *Laomedea geniculata*, for instance, I have counted in different specimens, 11, 19, 20 up to 29 tentacula, so that no reliance can be placed on them in determining the species.



polype depends on the colour of the food, and that those granules which are nearest the gastric surface are the first to change and so in gradation from the stomach to the external surface.\* There appears to be no anatomical difference between the granules of one part of the body and another; for if the animal be turned inside out, the outside will perform the function of digestion as perfectly as the original gastric surface, and the young will frequently sprout from the tentacula as well as from other parts of the body.

The horny or sheathed Genera vary a great deal in form, density, and the elaboration of their various parts, and have a very graceful appearance. Their form is more or less arborescent, and through their centres runs a granular pulp, which terminates, at the extremities of the branches, in polypes, which are modifications of the pulp and formed from it. In the *Hermia* the sheath is nearly rudimentary, and forms an imperfect covering for the upper part of the pulp; in the *Tubularia* the polypes always protrude beyond the tubes, which cover the pulp; in the *Thoa*, *Sertulariæ*, *Plumulariæ*, *Campanulariæ*, &c. the polypes are furnished with cells, into which they retire either from satiety, alarm, or for rest. In some the cells are sessile, in others on ringed footstalks; they are cup shaped and arranged in one or two rows on the stems or branches. At certain seasons of the year, more especially about summer and autumn, but differing in different species, there are other larger cells formed, which are the ovarian vesicles, which drop off as soon as the ova or *gemmules* are perfected.

The mode of reproduction varies, not only in the different genera, but in the same under different circumstances. In the naked *Hydroida* the young sprout from the sides of the parent as perfectly formed animals, exercising the functions of independent life, even before they become separated. The young after remaining attached for some time, are thrown off by a vital process and the cicatrix becomes obliterated; so that no point can be observed on the old polype to indicate the former situation of the young. This form of reproduction sometimes takes place so rapidly, that the young even to the third or fourth generation have young before the first is separated from the parent; this gives the whole a very grotesquely branched appearance.

In the *Sertulariæ* external ovarian vesicles are formed, which contain the reproductive *gemmules*. These are

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\* Trembly, Hist. des polypes p. 132. Roget's Bridgwater Treatise, vol. 2, p. 77 and 78. Mag. of Zool. and Bot., vol. 1, p. 235. Note \*.

immediately distinguished from the polype cells, by the irregularity of their distribution, their greater size and by their being urn-shaped, having narrow bases by which they are attached to the polypidom, and contracted and terminal apertures through which the gemmules escape into the sea. These vesicles when first formed, are filled with a granular pulp of an uniform consistence; it soon, however, gets dark towards its centre and decreases in bulk, leaving the sides of the vesicle free; the pulp now looks like a central column running from the base to the neck, which is closed. The pulp still bears the appearance of the central pith or of a rudimentary polype, without a mark to indicate the formation of the gemmules; and up to this point the formation of the gemmules is alike in all the *Sertulariadae*, though they differ in some measure afterwards. In the *Laomedea geniculata* the surface of the pulp soon gets furrowed and marked into indistinct globules with a darkish centre; and as development goes on the gemmules get more distinct from each other, and the central dark spot of a deeper tint, more defined, and the part surrounding it more transparent, resembling the albuminous zone of the common egg; and they finally escape in this manner, till all the pulp contained in the vesicle has been converted into reproductive gemmules. In a kindred species, the *L. gelatinosa* a different method is pursued. In it the pulp fills the vesicle as in the case above, and the surface becomes marked and irregular, forming the first appearance of the future germs. They then appear more distinctly, and as if formed from the pulp itself; they rapidly get more and more defined, and stand in relief from each other, remaining attached to the central placental column by minute umbilical cords. These cords getting more and more attenuated are finally ruptured and the gemmules float at

bodies are very interesting and are produced by minute vibratile cilia which cover their surfaces and are generally in rapid motion. By means of these cilia the gemmules revolve on their own axes from spot to spot, sometimes with a rapid gliding motion, at others by sudden springs; then stopping, and again bounding away to other spots, changing their forms from round to oval or irregular; but having found a situation on which to fix, they generally become oval. The time during which they remain free varies from a few hours to two days, depending on the collateral circumstances of the purity of the water, temperature, and the nature of the spot around which they move. These bodies are frequently called *ova*; but as they are neither ripened by fecundation nor enclosed in a special membrane, Mr. Hogg proposes to call them reproductive gemmules. After becoming once fixed, they are for ever after incapable of motion, and if they should be removed, rarely, if ever take root again. As soon as they are fixed, there grow from beneath numerous tubulous fibres, which serve as roots, by which a firmer hold is obtained; and in this state they are better enabled to withstand the violence of the waves. The upper portion of the gemmules gets elongated, the central pulp enlarged, and the first cell is formed.

Another mode of reproduction is frequently observed in the same genera. When a polypidom has been formed from a gemmule, the tubular fibres by which the polypidom is rooted frequently trail over a considerable extent of surface, and as they do so, get enlarged at short and irregular distances; which enlargements increase in an upward direction, till, first a stem, then a cell and finally a perfect polypidom is formed. This mode of reproduction is easily observed in the Sea-threads (*Laomedea*) so common on our shores throughout the year: the Poddod Coralline, (*Plumularia cristata*), is another elegant instance of the same thing.

This order then is capable of reproduction; 1st. By the young pullulating from the parent: 2ndly. By reproductive gemmules enclosed in external vesicles: 3rdly. By shooting from the tubular roots of existing polypidoms; and 4thly, it is sometimes said to occur by division; as by the artificial division of the fresh water polypes. Some Authors \* intimate that this last manner occurs also in the horny genera, but this I have never observed, and believe never to take place; for I have noted that if a branch be either cut off, or thrown off spontaneously, the utmost it appears to be capable of doing is to survive for a very short time.

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\* Jones' Animal Kingdom, p. 47. Sect. 66.

Many Physiologists consider that each polype of a polypidom, is a distinct being, and consequently that each polypidom is a congeries of animals united by a common axis. Though it is not of much importance whether we deem this opinion right or not, yet it will be best to consider the whole as one compound being, and the polypes as so many mouths through which the nutrition is taken in. There is nothing more visionary in this multiplication of mouths, than in the multiplication of feet in worms. The number of polypes on a polypidom varies according to the species, age, luxuriance and innumerable other circumstances; but sometimes the number is so great as to fill the mind with astonishment, and the wonder is increased the more we consider it. In a specimen of *Sertularia argentea* of luxuriant growth, in my possession, eighteen inches high, there are five pinnæ in a whorl, about fourteen whirls in an inch, and about thirty cells on each pinna, making the polypidom to contain the enormous number of 37800 individual polypes in the space of a foot and half.

There is but little community of feeling existing between the different polypes of the polypidom; nor can it, I think, be expected from the nature of their internal structure. No nervous system has yet been discovered, and from the simplicity of their organization, no such discovery, is likely to take place. An impression to be felt by more than one polype, must be somewhat roughly communicated, since it is probable, that impressions are communicated chiefly by the contact of the granules.

It is generally allowed, however, that there is a community of nourishment, and no one, who has watched these animals, will call it in question. If a *Sertularia* be taken, and one only of its polypes be fed, nourishment is evidently supplied



The mode of growth and the nature of the sheaths or horny envelopes, have been matters of curious speculation; and to the present time are by no means settled points. When a seed or *gemma* has become fixed, in the manner described above, and the roots thrown out from the base; the central pulp and its horny envelope become elongated superiorly. Taking the *Laomedea geniculata*, as an example, the central pulp of the gemmule becomes the pith; and after it has been elongated for a short distance, a lateral enlargement or rather elongation, takes place in the central pith, with a correspondent enlargement of the horny investment; this increases in length till it has become as long as the usual pedicle of the cell; at its termination it then becomes enlarged and bulbous, and the pedicle acquires a shrivelled appearance, which proves afterwards to mark the rudiments of the rings of the cell stalks. In a very short time the bulbous termination acquires a deeper tint towards its centre, and becomes lighter towards the circumference. At first the central shade is slight and indistinct, but soon becomes darker and more defined. As this condensation or organization goes on the pulp gets much more transparent towards its circumference, is drawn towards the central condensation and leaves behind it a transparent horny covering; and during this stage, it is very common to observe the semitransparent circumference of the pulp drawn into transverse folds, as if they were produced by a force acting towards the centre. In this way the pulp of the future polype is separated from the sheath. This being effected, the pulp acquires a serrated edge superiorly, and gets contracted inferiorly into the shape of the perfect polype. The serrations on the superior surface advance, and the tentacula are elaborated from them and folded on each other. Up to this point the cell is closed, and the polype excluded from any contact with the water. The superior portion of the horny sheath now gets thin, but not from pressure, as the polype is not in contact with it; and finally gives way about its centre and falls in, so as to give the cavity a funnel-shaped opening. The polype now feels the influence of the surrounding water, and immediately springs into active life, using its tentacula and capturing its prey as readily as the older ones. The funnel-shaped opening to the cell soon disappears and the differences which constitute the specific characters are formed. The stem is elongated in a similar manner; the pulp advances at one time the length of the articulations and stops for a short time, in the smaller kinds, till the cells and polypes are somewhat perfected; but in the larger and more luxuriant species this can hardly be distinctly noted, as the growth of several inches sometimes takes place in a very limited time. In the *S. polyzonias*,

I have some reason to believe that a large specimen can be formed under favorable circumstances, in the course of fourteen days. In the smaller species, a transient cessation of growth takes place at the various septa; at these points the pulp gets enlarged, and in the Sea Oak, *S. pumila*, where the two cells and stem are formed simultaneously, it appears as one very great enlargement. At first this enlargement of the pulp is undistinguished by parts or markings, which is however but of short duration, for three dark points appear on the pulp indicating the situations of the central pith with a polype on either side. The concentration or organization proceeds from below upwards, and the dark spots become more and more defined and separated from each other, the formation of the polype and cell being as described above. The extremities of the pinnæ and trunk are closed during growth, and not open, as some authorities have stated.\* The growth certainly takes place rapidly, and chiefly about summer and autumn. In a specimen of the *Sertularia argentea*, now before me, a shoot of six inches has taken place, which is of a pure silvery white, while the lower and older portion is of a light brown colour. On a cross section of the stem of the new part, the horny sheath was found to be of equal consistence throughout, and very delicately spongy or cellular; in a cross section of the older stem the texture was not so elastically spongy, but harder and firmer, more especially towards the inner circumference of the ring, where there was a brown zone occupying nearly one half the diameter, as if a solid material had been deposited in the intercellular substance, or the cells had been more closely pressed together. As another instance out of many, of the rapidity of growth in these creatures, in a specimen of the compound variety of the great tooth Coralline,

once found the *P. Catherina* growing on the bottom of a vessel in great abundance, after she had lain at Fowey harbour for a few months. The finest specimens of the *L. Geniculata* I have ever seen, were on the dorsal and caudal fins of the Picked dog-fish (*Sq. Acanthias.*) These and many other examples, tend to prove that these creatures are of quick growth.

The greatest number of the species of this order appear to be annual; very few, apparently surviving to the second year. Those growing near tide marks, cannot well be otherwise, for they soon become so completely encrusted with *confervæ* and sponges, that the apertures of many of the cells are closed, and most of the others partially so, thus inclosing the polype and preventing access to the water. Beside this the Sea Oak and Sea Threads, the former of which is frequently infested with *Entomastraca*, in different stages of development, grow on the fronds of sea weed, which are liable to be washed off by every storm. This is frequently the case, when the waves of the Atlantic roll heavily and furiously in, uprooting every thing in their course; yet after a few weeks of fine weather, specimens will be frequently found, even in fructification. The Sea threads, so common on all our shores, are to be found in the winter and spring, only in sheltered situations and beneath stones, but in the summer and autumn, on most of the weeds about low water mark, especially the *Laminaria digitata*. The larger kind appear to be of a similar nature; the *Sertularia polyzonias*, *rugosa*, *abietina*, *Plumularia falcata*, *frutescens*, *cristata*, &c., are more abundant about summer and autumn than at any other parts of the year, though this probably depends on the weather; for if the winter and spring be fine they may be procured as good as at any other season. In the summer and autumn the *Pinna Ingens* is almost always covered with different kinds of Coralline, while in autumn it is commonly bare.

As the polypidom increases in age, the horny sheath of the branches and pinnæ gets firmer and more condensed; and then falls off. Thus it is that in some species the lower branches are always wanting; which is the case with the Bottle brush Coralline, *Thuiaria thuja*, and less so with most of the other branched species. This does not depend on the violence of the waves, though that no doubt effects a great deal, but is rather the result of an action taking place in the animal itself. In a branch about to be thrown off, the polypes first get inactive and retire to their cells, the central pulps get paler, more transparent, and unhealthy down as far as where the branch joins the stem; at which point there is a well defined line of demarcation



formed, and at which the branch is finally thrown off. From the regularity of the process by which this is effected, the well defined scar left behind, and the central pith not being exposed, there is but little doubt left on my mind that each branch is thrown off by a vital process, similar to sloughing in animals, or the shedding of leaves in trees, and is not washed off accidentally by the sea. That very stout and rigid species the *Sertularia nigra* is exposed to the same violence, rendered more effective by its rigidity, and yet is not liable to have its pinnæ destroyed in a similar manner; and it is not unfrequently the case that in this last species the pinnæ are torn or twisted off at various lengths, but such cases are not at all like the loss in the *Th. thuja* or *T. articulata*. The terminations of the stem and pinnæ are said to be open, during growth, which, however, does not appear to be the case; but if care be not taken to keep the specimens healthfully alive, or if they should be placed in fresh water, these parts from being young and delicately formed, readily rupture and the granular pulp is forced through the apertures. To such an extent is this sometimes the case, that through the whole polypidom scarcely a trace of the pulp remains. This seems to arise from the irritability of the horny sheath, for that it is irritable there is sufficient proof.

There is an opinion entertained by some physiologists, that the external horny sheath is extravascular and consequently not endowed with vitality. It is considered by them as an exudation from the granular pulp. To this, however, my observations do not enable me to agree. Their mode of growth, the formation of their cells, and the manner in which they cast their branches tend against such a conclusion. In the formation of the cells, their

of the pinnæ and stems are ruptured, the central pulp is always partially, and frequently wholly expelled. How can these phenomena be satisfactorily explained, but by supposing the existence of irritability and pressure in the sheath? I have never obtained traces of vascularity, but different sections of the trunk prove that some kind of action is going on there. If a cross section of a stem be taken from a young part, it will be found of light texture and of equal consistence throughout; if lower, to be harder and darker, especially towards its inner margin, and so in gradation to the roots, where it will be found of a hard and somewhat brittle consistence throughout. The younger parts may be bent with safety, while the older portions are more rigid and can be bent only at the risk of breaking. From these facts, it appears to be the most philosophic to consider the polypidom as endowed with vitality and as forming with the polypes and pulp the entire animal.

Several species that grow near low water mark, will sometimes emit sparks of light when gently agitated, and this is greatly increased, if the water be gently heated. This is frequently the case with *Sertularia pumila*, and appears to arise from minute *Entomastraca* and *Macalephæ* which so constantly infest them.

The order is divided into three *Families* which contain eleven *Genera*; and examples of each, except the fresh water polype, are common on all parts of our coast. Indeed so rich are we in these beautiful productions, that the majority of those recognized as British are to be found in our seas. The Generic differences, will be found at large in their proper places in the following pages, where their species are described, and need not therefore be given here. A summary of the whole will be found at the end, drawn up without reference to the polype, to suit the convenience of those who are not intimately acquainted with the subject.

#### TUBULARIADÆ.

Polypes gemmiparous, the gemmules naked, pullulating from the base of the tentacula.

CORYNE, Gaertner.

*Generic Character*: Polypes fixed, single, naked, cylindrical or claviform, but contractile, the head with scattered filiform smooth tentacula, mouth none?

**C. SQUAMATA.** Body more or less clavate; the tentacula shorter than the body.

*Tubularia affinis*, Turton's Lin., vol. 4, p. 668. Stewart's Elem., vol. 2, p. 438. Coryne Squamata, Fleming's Brit. An., p. 553. C. Multicornis, Templeton in Mag. of Nat. Hist., vol. 9, p. 419. Johnston's Brit. Zooph., p. 109, pl. 2.

*Hab.* On sea weed and old shells, about low water mark, Gorran Haven, common; Polperro, rather rare; Talland sand-bay, and Looe.

This species is gregarious in its habit, growing on fuci and attaining the height of two to eight lines. It is attached by a narrow base; in young specimens, the appearance is like that of a common hydra, with the tentacula irregularly arranged on various parts of the body; in older specimens the base is prolonged into a narrow footstalk, with the tentacula at the summit. The tentacula are filiform and vary from five to twenty in number. The colour is reddish with occasionally deeper spots about the tentacula and base. It is sometimes found on the under surface of stones within low water mark.

HERMIA, Johnston.

*Generic Character:* Polype fixed, sheathed in a thin horny membrane, clavate or branched and subphytoid, the apices of the branches clubbed, and furnished with scattered glandular tentacula; no mouth.

H. GLANDULOSA. The branches in pairs, and the tentacula shorter than the enlarged heads of the branches.

*Tubularia Coryna*; Turton's Linnæus, vol. 4, page 668. Stewart's Elements of Natural History, vol. 2, p. 438. *Coryne Glandulosa*, Fleming's Brit. An., p. 553. Johnston in Mag. Nat. Hist., vol. 5, p. 631, fig. 110. *Hermia Glandulosa*, Johnston's British Zoophytes, p. 111, fig. at page 109, and pl. 4, figs. 1 and 2.

*Hab.* Found under stones about low water mark in sheltered situations; not uncommon. Polperro, Gorran, Whitsand-bay.

## TUBULARIA, Linnaeus.

**Generic Character:** Polypidom rooted, more or less plant-like, horny, tubular; no cells. The polypes protruding at the end of the branches, and not retractile. The head is crested with one or two rows of tentacula.

\* *Tubes undivided.*

**OATEN-PIPE CORALLINE.** *Tubularia Indivisa.* Tubes clustered, simple, cylindrical, narrowed and interwoven at the base. The head is clustered with one or two rows of tentacula.

*Adianti aurei minimi facie planta Marina.* Ray's Synop., vol. 1, p. 31., no. 4. Remarkable sea plant, Lhwyd's Phil. Trans. Tubular Coralline, like oaten pipes, Ellis' Corallines, p. 31, pl. 16, fig. c. *Tubularia indivisa*, Lamouroux's Cor. Flex., p. 230. Blumenbach's Man., p. 272. Turton's Lin., vol. 4, p. 666. Stewart's Elem., vol. 2, p. 437. Flem. Brit. An., p. 552. Johnston's British Zoophytes, p. 113, pl. 3, figs. 1 and 2. Solander and Ellis' Zooph., p. 31.

**Hab.** Attached to stones from deep water. Polperro, West Combe, Lansallos; rare. On the Gwinges rocks, near Mevagissey, common, *Mr Peach*.

This, in particular situations, is very common, as on the Gwinges rocks near Gorran and the neighbourhood, and in deep water about three miles from the shore, Polperro. The tubes are simple from the roots to the terminations, The height of the tubes varies from two to fourteen inches, and they are about the tenth of an inch in diameter. At the roots they are frequently twisted and convoluted on each other, but they soon rise simple and undivided. The centre is filled with a soft granular pulp which passes up each tube and terminates in the polypes. The polype heads are red and incapable of being withdrawn into the tubes. The mouth is produced into a conical elevation, and around is a circle of red tentacula; inferior to this circle is another in which the tentacula are much longer than in the one above. Below this last circle, are produced the reproductive gemmules. The young sometimes pullulate from this part, and when separated from the parent, they travel to some other spot by means of their tentacula, till having selected a proper situation, they fix themselves by their base. From this spot they never afterwards move; but a horny ring is formed round the base, and increasing as the polypidom grows, forms the tubes of the perfect animal. Sometimes, a few specimens are found sparingly branched.

**WINDPIPE CORALLINE.** *T. Larynx.* Tubes clustered, ringed at intervals; polypes with a double row of tentacula.

*Fucus Dealensis fistulosus*, *Laryngæ similis*. Ray's Synop., vol. 1, p. 39., no. 8. Tubulous Coralline, wrinkled like the windpipe, Ellis' Corallines, p. 30, no. 1, pl. 16, fig. b. *Tubularia Muscoides*, Turton's Lin., vol. 4, p. 687. Stewart's Elem., vol. 2, p. 438. Fleming's Brit. An., p. 552. *Tubularia larynx*, Ellis and Solander's Zooph., p. 31, no. 2. Johnston's Brit. Zooph., p. 115, pl. 3, fig. 3, pl. 4, figs. 3 and 5.

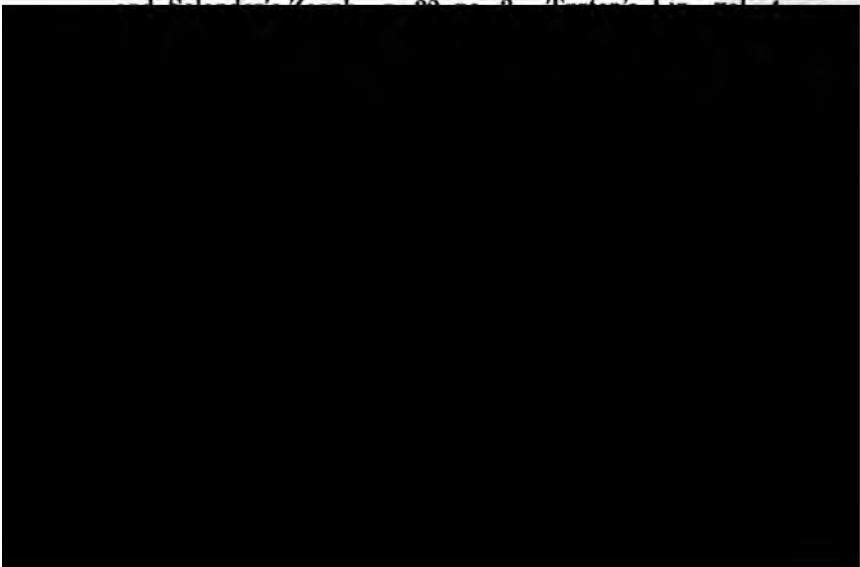
*Hab.* On shells and stones beyond low water mark, and on shells from deep water; common; at Talland sand-bay.

There are two varieties of this species, one branched and the other not. The branched variety gives off its branches in a very irregular manner, and generally at an obtuse angle with the trunk. This is however liable to considerable variation and irregularity. The unbranched variety is generally found in clusters, interwoven at the base, and filiform. This species is distinguished from the last, in dried specimens, by the tubes being ringed at regular intervals, presenting the appearance of the windpipe of a bird; from which it derives its name *larynx*. In a recent state, the rings are visible by transmitted light. The polypes are naked, with two circles of tentacula. The head is light red, the tentacula are white, or white fringed with red. The reproductive gemmules rise from the base of the tentacula.

**\*\* Tubes branched.**

**T. RAMOSA.** Tube single and regularly branched; alternate and ringed; the polypes with only a single row of tentacula.

Small ramified tubular Coralline, Ellis' Coral., p. 31, no. 3, pls. 16 and 17, fig. a A. *Tubularia Ramosa*, Ellis and Solander's Zooph., p. 31, no. 3. Turton's Lin., vol. 4, p. 687.



This species is generally more branched than the branched variety of *T. Larynx*, and usually in an alternate manner. The branches do not rise from the trunk at such an obtuse angle as in the last; the tubes are smaller, more dense, of a deeper colour, and do not present such decided rings as *T. Larynx*. The polype heads are red, mouth conical, with a single circle of tentacula. Ellis' figure in his "Essay on Corallines" is very good and characteristic.

**T. RAMEA.** Arborescent, stem and branches formed of agglutinated filiform tubes, irregularly branched. Polypes, with a single row of tentacula.

*Tabularia Ramea*, Johnston's Brit. Zooph., p. 117, pl. 5, figs. 1 and 2.

*Hab.* On Pinna Ingens, south of the Deadman point.

The appearance of this species is so remarkable, as to render a fair specimen difficult to be confounded with any other. It is very bushy and very closely resembles a miniature tree. I have a fine specimen from eight leagues off the Deadman point, eight inches high. It is very stout, rigid and of a dark brown colour. The chief branches and trunk are composed of many agglutinated tubes, which decrease in number as the branches divide; the ultimate or terminal branches are composed of a single tube with one or two annulations at the origin of each. I have not observed the polypes but they are said to have a single row of white tentacula. The roots are matted together like a coarse sponge.

#### SERTULARIADÆ.

Polypes gemmiparous, the gemmules enclosed in ovarian persistent vesicles, scattered on the polypidom.

THOA, Lamouroux.

*Generic Character:* Polypidoms rooted, arborescent; the stem composed of aggregated sub-parallel capillary tubes; the branches alternate, spreading bifariously; cells tubular, indistinct, alternate; ovarian vesicles irregularly scattered. Polypes hydraform, scarcely retractile within their cells.

**HERRING-BONE CORALLINE.** *T. Halecina.* Cells oval, vasiform, contracted near the mouth; mouth subterminal and somewhat patulous.

*Corallina scruposa pennata*, cauliculis crassiusculis rigidis, Raii Synop., vol. 1, p. 36. Herring-bone Coralline, Ellis' Coral., p. 17, no. 15, pl. x. *Sertularia halecina*, Ellis and Solander's Zooph., p. 46, no. 15. Turton's Lin., vol. 4, p. 678. Stewart's Elem., vol. 2, p. 442. Fleming's Brit. An., p. 542. Templeton in Mag. Nat. Hist., vol. 9, p. 468.

*Thoa Halecina*, Lamouroux's Cor. Flex., p. 211. Johnston's Brit. Zooph., p. 119, pl. 6.

*Hab.* On stones and shells, especially the *Pinna Ingens*, from deep water west of the Eddystone to Falmouth; common.

This species grows to the height of eleven inches, and from four to eleven inches in breadth. In young specimens, the polypidom is of a light horn colour, which in the older turns to a dark brown. The polypidom is arborescent, much branched, and rooted by numerous fibres interwoven and matted with each other. The trunk is formed of numerous sub-parallel tubes agglutinated together. The branches are brown, and when dry very brittle; they are irregularly given off; the pinnæ are alternate, and both erecto-patent. Here for the first time the polypes have cells, into which they can retire for shelter; they do not, however afford such complete shelter as in the following genera. The cells are alternate, tubular, bi-articulate and with plain apertures. The *Ovarian vesicles* are scattered over every part of the polypidom, but are most abundant about the *axillæ* of the pinnæ; they are pedunculated, smooth, with a long neck and edges round them like a jug.

**T. MURICATA.** Very rigid, irregularly branched, branches semi-erect and spreading; cells alternate, visible on the younger branches only; vesicle small, round, and prickly, cup shaped, with an even aperture, separated from the stem by a joint.

*Sertularia Muricata*, Ellis and Solander's Zooph., p. 59, pl. 7, figs. 3 and 4. Turton's Lin., vol. 4, p. 681. Stewart's Elem., vol. 2, p. 445. *Laomedea Muricata*, Lamouroux's Cor. Flex., p. 209. *Thoa Muricata*, Johnston's Brit. Zooph.,



and separated from the stem by a joint, short with everted apertures; vesicles scattered. Polypes hydraform.

\* *Cells distinctly alternate.*

**GREAT TOOTH CORALLINE.** *S. Polyzonias.* Erect, subflexuous; cells ovate, with a wide somewhat uneven aperture; vesicles obovate, wrinkled across, the orifice contracted and plain.

*Corallina minus ramosa, alterna vice denticulata.* *Muscus marinus denticulatus minor, denticellis alternis;* Raii Synop., vol. 1, p. 35, no. 13. Great Tooth Coralline, Ellis' Coral., pl. 5, pl. 2, fig. a A., and pl. 38, fig. 1 A; *Sertularia polyzonias*, Ellis and Solander's Zooph., p. 37, no. 3. Turton's Lin. vol. 4, p. 683. Blumenbach's Man., p. 273. Stewart's Elem., vol. 2, p. 447. Fleming's Brit. An., p. 542. Templeton in Mag. Nat. Hist., vol. 9, p. 468. Johnston's Brit. Zooph., p. 122, pl. 8, figs. 1, 2, and 3. Lamouroux's Cor. Flex., p. 190.

*Hab.* On fuci beyond low water mark, on stones and shells from deep water; common. Parasitical on *Aleyonium digitatum*, or *dead man's hands*, and other corallines; very common, from the Rame Head to the Lizard, and ten leagues from the shore.

There are two varieties of this species, both alike common; the first, where the stem is composed of a single fibre and sparingly branched, rarely exceeding two inches in height; the second, where the stem is composed of a number of tubes twisted on each other and growing to the height of six inches. In the last variety, the polypidom is erect, rigid, and rooted, with tubular fibres which are closely matted together. I have a fine specimen from deep water, growing in a large tuft, ten inches in height.

*The following has also been considered a variety of this species, but is now allowed to be distinct.*

**ELLIS' CORALLINE.** *S. Ellisii.* Climbing, flexuous; the cells urceolate, bulged at the base, with a four toothed rim; vesicles with the opening four-toothed.

Ellis' Corallines, p. 6, pl. 2, fig. b, B. *Sertularia Ellisii*, Johnston's Brit. Zooph., p. 123.

*Hab.* On *Ascidia* with other corallines; rather rare.

This can be distinguished from the last by the stem being more zigzag, the mouth of the cell more decidedly four-toothed, and the whole more slender and climbing. The vesicles are vasiform and surrounded with prominent bands, which give them a remarkable appearance.



**SNAIL-TREFOIL CORALLINE.** *S. Rugosa.* Cells ovate, wrinkled transversely, the mouth narrow, with three or four small teeth on the rim. Ellis.

Snail-trefoil Coralline, Ellis' Coral., p. 26, no. 23, pl. 15, fig. a A. *Sertularia Rugosa*, Turton's Lin., vol. 4, p. 678. Ellis and Solander's Zooph., p. 52, no. 24. Stewart's Elem., vol. 2, p. 442. Fleming's Brit. An., p. 542. Templeton in Mag. Nat. Hist., vol. 9, p. 406. Johnston's Brit. Zooph., p. 123, pl. 8, figs. 4, 5, and 6. *Clytia rugosa*, Lamouroux's Cor. Flex., p. 204.

*Hab.* On the roots of fuci, sponges, &c.; Lantivet bay.

This species is not common; but when found it is generally in large companies, shooting up from the trailing tubular roots of each other. It rarely exceeds an inch in height, is erect, and very sparingly branched. The cells are irregularly arranged, sometimes being alternate, and at others crowded together; it may, however, be immediately recognised by its remarkably wrinkled cells. The vesicles very closely resemble the cells, but are much larger and the apertures are three-toothed.

\* \* Cells in pairs, opposite, or semi-alternate.

**LILY OR POMEGRANATE FLOWERING CORALLINE.** *S. Rosacea.* Cells opposite, closely arranged, mouth entire, plain, and truncated; vesicles pear-shaped, with a very uneven mouth.

Lily or pomegranate flowering Coralline, Ellis' Cor., p. 8, no. 7, pl. 4, fig. a A. *Dynamena Rosacea*, Lamouroux's Cor. Flex., p. 178. Fleming's Brit. An., p. 544. *Sertularia Rosacea*, Ellis and Solander's Zooph., p. 39, no. 7. Turton's Lin., vol. 4, p. 676. Stewart's Elem., vol. 2, p. 440. John-

and their upper part is remarkably furrowed and surrounded by numerous spines "like a coronet." All the vesicles are not alike ornamented by the spines, but the spines are always present, sometimes large and at others small. Ellis appears to think that the coronated state of the vesicles, depends on the expulsion of the *gemmules*; but this is not always the case. In a specimen before me the *gemmules*, though ripe are not yet excluded, and the spines not only surround the upper edge of the vesicle, but are scattered over one third of the upper surface. Johnston says, "Pallas asserts that the comparison, as well as the figures of them in Ellis' work are inaccurate, a criticism the truth of which Ellis denies in his subsequent volume on Zoophytes:" many of those ovaries that I have examined are unlike any representation of them I have yet seen, while others closely resemble the figures of Ellis and Johnston.

**SEA OAK CORALLINE.** *S. Pumila*. Cells opposite, approximated, shortly tubular, the top everted with an oblique somewhat mucronated aperture; vesicles ovate.

*Corallina pumila repens*, minus *ramosa*. *Muscus coralloides pumilus*, *denticellis bijugis*, Raii Synop., vol. 1, p. 37, no. 19. *Corallina pumila erecta*, *ramosior*. *Muscus coralloides pumilus ramosus*, Raii Synop., vol. 1, p. 37, no. 20, pl. 2, fig. 1. (not good). Sea Oak Coralline, Ellis' Cor., p. 9, pl. 5, fig. a A. *Sertularia pumila*, Ellis and Solander's Zooph., p. 40, no. 48. Turton's Lin., vol. 4, p. 676. Stewart's Elem., vol. 2, p. 441. Templeton in Mag. Nat. Hist., vol. 9, p. 468. Johnston's Brit. Zooph., p. 125, pl. 9, figs. 3 and 4. *Dynamena pumila*, Lamouroux's Cor. Flex., p. 179. Fleming's Brit. An., p. 544.

**Hab.** About low water mark on the shelving sides of rocks; common the whole length of the south coast.

Very common on the shelving sides of rocks and on fuci, especially *Fucus serratus*, near low water mark. It seems to prefer those rocks which have a southern aspect, though it does not confine itself exclusively to the south side, but seeks for shelter in the crevices and beneath the overhanging weed wherever it can be found, on rocks so situated. It is of a darkish brown colour, rarely exceeding an inch in height, sparingly branched and rooted by creeping tubular fibres, from which new polypidoms rise at irregular intervals. The cells are opposite, and closely approximated; they are bulged at the base, their apertures somewhat contracted and everted; and each pair is separated from the other by a joint. The vesicles are pear-shaped, with tubular apertures, and are attached to the base of the

cells by short peduncles. In the summer and autumn they are plentifully produced on all parts of the polypidom. The polype is granular, with fourteen stout tentacula; and when in activity, protrudes itself about the length of the cell beyond the aperture. The life of this species can be but of short duration. When growing on *fuci*, it is destroyed by the waves tearing these *fuci* from the rocks; and when it fixes itself on the rocks, it soon becomes infested with minute sponges and *convervæ* which grow over the apertures of the cells and prevent the polypes from having access to the water; whereby they perish. It is also much infested with minute insects (*entomastraca*) of the genus *Cyclops*, which is probably the cause of the light so frequently given off when this species is gently struck while in the water.

**SERTULARIA PINNATA.** Cells opposite, tubular, the upper part free and divergent, with an even patulous aperture; vesicles obconical, trituberculate on the top.

*Sertularia Pinnata*, Johnston's Brit. Zooph., p. 127, pl. ix, fig. 5 and 6. *Sertularia Fuscescens*, Turton's Lin., vol. 4, p. 677. Lamouroux's Cor. Flex., p. 195. *Dynamena Pinnata*, Fleming's Brit. An., p. 545.

*Hab.* "Oceanus ad Prom. Lacertæ, Cornubiæ," Pallas. I have not met with a specimen, and it is therefore called Cornish on the authority of Pallas.

**BLACK CORALLINE.** *S. Nigra.* Cells very nearly opposite, approximated, appressed, small ovato tubular, apertures even and not everted; vesicles like an unripe fig, with small contracted terminal apertures.

*Sertularia Nigra*, Turton's Lin., vol. 4, p. 676. John-

ston's Brit. Zooph., p. 127, fig. 5 and 6. Turton's Lin., vol. 4, p. 677. Lamouroux's Cor. Flex., p. 195. Fleming's Brit. An., p. 545.

elongated peduncles, which arise from the base of the cells. Their apertures are terminal, unarmed and contracted; when recent and living they are smooth, but are frequently marked, when preserved, with longitudinal furrows. This form of the vesicle is rarely observed except when it has arrived at perfection, but in a less advanced state the upper portion is flat, and the circumference irregularly lobulated. They only arise from the upper edge of the pinnae, and are all turned to the same side of the fan of the polypidom. This species, as it is seen in collections, is of a dark or black-brown colour, from which it derives its specific name; but to see it in all its beauty it must be examined in a living state and soon after it is taken from the sea; when instead of being black, it will be found of a beautiful and delicate pink, and in some instances of a deep arterial blood colour. It is the stoutest and most rigid of all our native Sertulariæ, but there are several others which exceed it in beauty and delicacy. Though not so generally diffused as many others, it is far from being uncommon in particular localities. Off the Deadman-point it is found, though rarely; at a few miles west and north-west of the Eddystone lighthouse it is common, and from that locality I have obtained some exceedingly fine specimens, which, from January to May, have abounded in ovarian vesicles. It is firmly rooted to the stone on which it grows, by tubular matted fibres, of a deeper tint than the other parts. On the lower portion, the *Campanularia dumosa* is frequently abundant.

According to Johnston, Milne Edwards supposes there are two species confounded under this name. The species, however, that I have found in the Cornish waters is the same as that figured by Johnston at pages 119 and 129, though I have not observed the irregularity in the distribution of cells on the pinnae, or the form of the apertures of those on the trunk, figured and noticed by him.

**SEA TAMARISK.** *S. Tamarisca*. Cells opposite, tubular; the upper half divergent, with a wide aperture, sinuated on the margin; vesicles oval, truncate, with two small points on the corners, and a tubulous mouth.

Sea Tamarisk, Ellis' Coral., p. 4, no. 1, pl. 1, fig. a. A. Sertularia Tamarisca, Ellis and Solander, p. 36, no. 1. Turton's Lin., vol. 4, p. 676. Stewart's Elem., vol. 2, p. 441. Johnston's Brit. Zooph., p. 130, pl. x, figs. 2, 3, and 4. Lamouroux's Cor. Flex., p. 188, no. 313. Dynamena Tamarisca, Fleming's Brit. An., p. 543.

*Hab.* On the Pinna Ingens, from deep water, rare.

The only locality in which this has been found is in deep water off Mevagissey, and even thence only a few specimens

have been procured. It varies in height from four to twelve inches, but the Cornish specimens did not exceed six. It is rather delicate, and of a semi-transparent horn colour inclining to pink when living, changing to a deeper and duller colour in dying. The branches, which are widely separated from each other, are given off alternately. The cells are opposite, pellucid, attached to the polypidom by the base, the upper half being free and divergent, and distributed in a biserial manner; their apertures are patulous, with two lateral tooth-like inequalities. The vesicles are unilateral and arise from the base of the upper row of cells; they are shortly pedunculated, stout, longitudinally furrowed, and their apertures are small and tubular. They vary in shape according to age. When young they are urn shaped with tubular apertures; a little older, the rim at the base of the neck becomes enlarged and sharp-edged, with two small horns; when old, the neck and mouth disappear after the ova have escaped, and the margin becomes irregularly festooned.

SEA FIR. *S. Abietina*. Cells very nearly opposite, tubular, slightly bellied at the base; mouth simple and unarmed; the upper half free: vesicles ovoid with a neck.

*Corallina marina Abietis* forma. *Musculus marinus major argute denticulatus* Raii Synop. Stirp., vol. 1, p. 35, no. 12. Sea Fir, Ellis' Cor., p. 4, pl. 1, fig. b, B., no. 2. *Dynamena Abietina*, Fleming's Brit. An., p. 543. *Sertularia Abietina*, Ellis and Solander's Zooph., p. 36, no. 2. Lamouroux's Cor. Flex., p. 186 and 187. Turton's Lin., vol. 4, p. 676. Blumenbach's Man., p. 273. Stewart's Elem vol. 2, p. 441. Templeton in Mag. Nat. Hist., vol. 9, p. 468. Johnston's Brit. Zooph., p. 130, pl. x., fig. 1, 1.

*Hab.* On stones, shells and *Gorgonia verrucosa*, common.

by short peduncles from between the cells, and have small sub-terminal apertures which are generally turned towards the trunk.

This species bears a general resemblance to the last, but differs in having a closer arrangement of the branches, the base bellied, aperture contracted, and in the semi-alternate distribution of the cells.

**FERN CORALLINE.** *S. Filicula*. Cells in the form of a Florence flask, opposite, a single one in the axilla of each pinna; vesicles pear-shaped, smooth at the aperture and shortly tubulous, entire.

*Dynamena Filicula*, Fleming's Brit. An., p. 544. Fern Coralline, *Sertularia Filicula*, Ellis and Solander's Zooph., p. 57, table 6, fig. c. C. Turton's Lin., vol. 4, p. 681. Stewart's Elem., vol. 2, p. 445. Lamouroux's Cor. Flex., p. 188. Johnston's Brit. Zooph., p. 131, pl. 11.

*Hab.* On Fuci, rather rare. Talland sand bay, Polperro.

This species varies in height from one to four inches, is of a yellowish brown colour, zig-zag and spreading laterally. The branches are given off somewhat bifariously, but sometimes very irregularly. The trunk, and branches are divided at short intervals by imperfect septa. The pinnæ are numerous, and arise in an alternate manner, one from each internode. The cells, which are bellied at the base with plain everted apertures, are opposite and in single pairs on each internode, with a single cell in the bend of each pinna as it arises from the trunk. The vesicles are pear shaped, arising from the upper part of the base of the cells by a short peduncle, and the apertures are contracted and tubular.

This species may be distinguished from all others by the single cell which stands in the axillæ of all the pinnæ. In other respects it approaches very closely to the Great toothed Coralline.

**SEA HAIR.** *S. Operculata*. Cells opposite, larger above than below; mouth patulous, scarcely everted, the outer edge terminating in a long tooth with two lateral smaller ones, a joint above each pair; vesicles pedunculated, obovate.

*Corallina muscosa denticulata procumbens, caule tenuissimo, denticellis ex adverso sitis.* Raii Synop. Stirp., vol. 1, p. 36, no. 18. Sea Hair, Ellis' Corals, 8, no. 6, tab. 3, fig. b. B. *Dynamena operculata*, Fleming's Brit. An., p. 544. Lamouroux's Cor. Flex., p. 176. *Sertularia operculata*, Ellis and Solander's Zooph., p. 39, no. 6. Turton's Lin., vol. 4, p. 676. Stewart's Elem., vol. 2, p. 441. Templeton



in *Mag. Nat. Hist.*, vol. 9, p. 468. Johnston's *Brit. Zooph.*, p. 132, pl. xi., fig. 2. 2.

*Hab.* On the stems of the larger fuci, common. Whitsand bay, Looe, Goran, Mevagissey, Veryan bay, Polperro, Mount's bay.

The name of Sea Hair, applied to this species, is very characteristic of its general appearance, and to an inattentive observer it would pass for something of the kind, as it lies exposed on the shore. It grows plentifully all round our rocky shores on the stalks of the larger sea weed, a little beyond low water mark. On the south eastern parts of our coast, it occurs most commonly as short, delicate hair-like fibres on the stalks of the *Laminaria digitata*, and rarely exceeding an inch and half in height; but frequently after a storm, clumps, as large as a child's fist, are washed ashore from deep water. About Mevagissey, Goran, and west of the Deadman point in Veryan bay, it occurs in masses as large as a child's head, or even larger. Mr. Peach of Goran has some very fine specimens in his collection, and I have some equally fine, from the same neighbourhood. I have been informed that several years ago, many cartloads of this Zoophyte were drawn on shore in a trawl net at Mevagissey and sold as manure; wheiher this is true or not, it is certainly more abundant and finer there, than on any other part of our coast that I have examined. It is of a vandyke brown colour, very slender and elegantly waved. Its offshoots are numerous, alternate and of equal size to the first. It does not like the rest of the species of this genus, give off its branches from a continuous trunk, but the offsets frequently become the continuations of the height of the polypidom. It is divided at short intervals by imperfect

**SQUIRREL'S TAIL.** *S. Argentea*. Polypidom spiry and waved; cells alternate, bulging at the base, and sharply pointed at the outer edge of the aperture, the upper half divaricated. Vesicles vasiform.

*Corallina muscosa*, alterna vice denticulata, ramulis in creberrima capillamenta sparsis, Raii Synop. Stirp., vol. 1, p. 36, no. 16. Squirrel's Tail, Ellis' Coral., 6, no. 4, tab. 2, fig. c. C. Sertularia Argentea, Ellis and Solander's Zooph., no. 4, p. 38. Turton's Lin., vol. 4, p. 667. Stewart's Elem., vol. 2, p. 442. Templeton in Mag. Nat. Hist., vol. 9, p. 468. Johnston's Brit. Zooph., p. 134, pl. xii. and pl. xi., fig. 3, 3. Dynamena Argentea, Fleming's Brit. An., p. 544. Sertularia Argentea, Lamouroux's Cor. Flex., p. 192.

*Hab.* On stones and shells from deep water off Polperro, common; St. Ives bay.

Since writing the paper on the Zoophytes of Cornwall for the Polytechnic Society, I have found this species to be more common in deep water than I had previously supposed. In the adult state it is the most beautiful of all our corallines. The stem is smooth, without cells, divided at irregular intervals by imperfect septa, and grows to the height of eighteen inches. The pinnæ, which bear the cells, arise in pairs from each internode in such a manner that five or six encircle the stem; and as each pinna is again branched in an irregular, though somewhat dichotomous manner, the whole forms so bushy an appearance, as entirely to hide the stem from view, from which circumstance it derives its name. The polypidom sometimes consists of a single stem only, but at others it has one or more branches of the same size and character as the primary trunk, which greatly adds to the beauty of the species. On our shores, however, the larger specimens are generally much injured from the violence of the waves; having their cells and pinnæ broken or washed off. The cells are biserial, alternate, bulging at the base with diverging and contracted necks; their apertures are but slightly everted, being rather directed upwards and laterally than outwards. In some specimens the outer edge of the mouth is produced into a sharp point, which in many others is wanting, the apertures being altogether plain. The vesicles arise along the upper edges of the pinnæ, and are vasiform, inclining to the ovoid, smooth, and transparent when living, semi-opaque and transversely wrinkled, when preserved.

Young specimens are very common in deep water, at from one to seven or eight leagues from land, but in form they bear no resemblance to the old. They are simply pinnated in an



alternate manner; the stem is slightly zig-zag with a few distantly arranged cells on it. The upper part of the stem, in this variety, frequently bends from the straight line at an obtuse angle. In young and newly formed parts the colour is of a pure silvery white, which changes with age to a straw yellow and finally to a brown colour.

**SEA CYPRESS.** *S. Cupressina*. Polypidom cauliferous; cells nearly opposite, tubulous, adnate; aperture large and not everted, with one large and two small lateral teeth. Vesicles vasiform.

Sea Cypress, Ellis' Coral., p. 7, no. 5, tab. 3, fig. a. *Sertularia Cupressina*, Ellis and Solander's Zooph., p. 38, no. 5. Turton's Lin., vol. 4, p. 667. Stewart's Elem., vol. 2, p. 442. Templeton in Mag. Nat. Hist., vol. 9, p. 468. Johnston's Brit. Zooph., p. 135, pl. xiii. *Dynamena Cupressina*, Fleming's Brit. An., p. 543.

*Hab.* St. Ives bay.

The only Cornish locality from which this species has been obtained is St. Ives bay; from which I have procured three specimens. It is stouter and more spiry than the last. The stem is stout and gradually tapers from the base to the apex; and is slightly zig-zag, which is made more apparent by the pinnæ falling off and leaving a slight protuberance. The pinnæ are alternate and branched, the branches hanging nearly parallel to each other. The cells are biserial, closely arranged and semi-alternate or opposite; they are smooth, and closely adherent; the base slightly bulging; the apertures look upward, are patulous and armed with a long tooth on the outer, with two smaller ones on the lateral edge, on each side of the pinnæ. The vesicles are vasiform with short peduncles; their apertures small and tubular and at

the cells of the *S. argentea* never possess the lateral teeth observed in the *S. cupressina*. The prominent tooth on the external edge of the apertures of the latter is sometimes found in the former; and the lateral teeth which are always absent in the *S. argentea* are sometimes deficient in the *S. cupressina*; and in such a case it would be almost impossible to decide to which species, such a specimen belonged. Ellis says the *S. cupressina* grows in deep water, while the other is confined to shallower water near the shores. My observations are just the reverse of this; for all the specimens of the *S. argentea* which I have found on the Cornish coast have been at from eight to ten leagues from land, in about fifty fathoms water. At what depth the *S. cupressina* grows about St. Ives I do not know, but the water in that neighbourhood, though deep, is, I believe, rather shallower, than of that portion of the English channel from which my specimens of the *S. argentea* have come.

THUIARIA. Fleming.

**Generic Character:** Polypidom plant-like, rooted by tubular fibres, erect, dichotomously branched or pinnated; the cells sessile, biserial, adnate to the rachis, or imbedded in the substance of the stem and branches; vesicles scattered; polypes hydraform.

The most characteristic difference between this and the preceding genus, and by which it may be distinguished at once, is that the cells are imbedded or close to the stem, and the aperture not everted.

**BOTTLE-BRUSH CORALLINE.** *Thuiaria Thuia*. "Cells ovato-elliptical, rather acute; vesicles pear shaped."—Sibbald.

Bottle-brush Coralline, Ellis' Coral., p. 10, no. 9, pl. 5, fig. b B. *Sertularia Thuja*, Ellis and Solander's Zooph., p. 41. Turton's Lin., vol. 4, p. 678. Stewart's Elem., vol. 2, p. 442. Lamouroux's Cor. Flex., p. 193. *Thuiaria Thuia*, Fleming's Brit. An., p. 545. Johnston's Brit. Zooph., p. 137, pls. xiv. and xv., figs. 1, and 2.

**Hab.** From deep water. Polperro.

"Stem percurrent, erect, filiform, rigid, zig-zag, knotted, naked underneath, bearing on the upper part a cylindrical tuft of dichotomous short equal branches, coming off alternately, and so disposed that four complete a whirl." "Cells close pressed, arranged in two rows, sub-alternate, smooth, tapered from the base to a contracted orifice." Johnston. A single specimen is all that has yet been obtained.

The young of this species very much resembles the next, (*Th. Articulata*), but may always be distinguished from it,


by its having great intervals between the pinnæ, and the cells not having their apertures everted as in the following species; and beside this the aperture here is always pointed.

**SEA SPLEENWORT, OR POLYPODY.** *Th. Articulata*. Polypidom plumous; stem of equal thickness throughout; pinnæ stout, closely arranged, alternate; cells biserial on the pinnæ and stem; imbedded, closely arranged, alternate; vesicles elliptical.

Sea Spleenwort or Polybody, Ellis' Coral., p. 11, no. 10, pl. 6, fig. a A. Sertularia Lonchitis, Ellis and Solander's Zooph., p. 42. Sertularia Lichenastrum, Torton's Lin., vol. 4, p. 683. Stewart's Elem., vol. 2, p. 447. Thuiaria Articulata, Fleming's Brit., An., p. 545. Johnston's Brit., Zooph., p. 138, pl. 15, fig. 3 and 4.

*Hab.* On the back of the corwich crab, (*Maia Verrucosa*) Polperro, Goran-haven on a stone from deep water, *Mr. Peach*. It is not at all rare to meet with fragments, with all or most of the pinnæ gone, but it is very rare to meet with a good specimen.

This species varies in height from two to four inches, but one specimen which Mr. Peach procured from Torbay, Devonshire, measured five inches and a quarter. When living it is of a beautiful pellucid amber colour, which becomes duller in dying. The stem is stout, of nearly equal thickness throughout, and divided very irregularly by imperfect septa. The pinnæ, which are closely arranged, arise from the stem in an alternate manner, and are confined to its upper part; those on the lower portions are thrown off in regular succession, as the polypidom advances in growth. The cells are biserial, on the pinnæ and trunk, adnate, closely arranged, alternate; their apertures are even, everted and



**LOBSTER'S-HORN CORALLINE, OR SEA BEARD.**

*A. Antennina.* Stem covered with hair-like branchlets, arranged in a circular manner round the stem: cells wine-glass shaped, with two hollow denticles between each. Pl. vii.

Lobster's-horn coralline, or sea-beard, Ellis' Cor., p. 15, no. 14, pl. 9, fig. a b, A. B. C. Sert. antennina, Turton's Lin., vol. 4, p. 679. Stewart's Elem., vol. 2, p. 443. Ant. antennina, Fleming's Brit. An., p. 516. Johnston's Brit. Zooph., p. 139, pl. xvi. Ellis and Solander's Zooph., p. 45.

*Var. 1.* Not branched. *Corallina astaci corniculorum* æmula.—*Musculus marinus* seu *Coralloides non ramosus erectus*, Raii, Synop. Stirp., vol. 1, p. 34, no. 10. Ant. indivisa, Templeton in Mag. Nat. Hist., vol. 9, p. 468. Johnston's Brit. Zooph., p. 139, pl. 16, fig. 1.

*Var. 2.* Branched. *Corallina ramosa cirris obsita*, Raii, Synop. Stirp., vol. 1, p. 35, no. 11. Ant. ramosa, Templeton in Mag. Nat. Hist. vol. 9, p. 468. Johnston's Brit. Zooph., pl. xvi., fig. 2.

*Hab.* On *Pinna ingens*, oysters, shells, stones, and sand, from deep water; very common, especially in oyster beds.

There are two variations of this species which at first would seem to constitute specific differences, but after many examinations, I am inclined to think they are only varieties, and Dr. Johnston is of the same opinion.

The first variety generally grows in clusters on sandy soils or on stones lying in sand, rooted together by small brown tubular fibres, which are matted together by sand and fragments of shells. The stem grows to the height of about eleven inches, surrounded by its hair-like branches.

The second variety grows most commonly on oysters in single specimens, and not in tufts as the first. The branches generally arise from the lower part of the stem and nearly at right angles; sometimes at about 45°, and from all parts of the stem. The branches are similar to the trunk, and straight; though I have another variety about nine inches in height, which is branched, and the branches again branched like a tree, variously twisted and bent. The stem and branches are of a yellow pellucid horn colour, when living, but are duller in dead specimens; they are of equal thickness throughout and divided at short intervals by imperfect septa. The branchlets surround the branches and stem, in a verticillate manner, and are so slender that they resemble hair. The branchlets have a single row of cup-like cells, distantly arranged on their upper edges. The cells rest

one in each internode, and between them are two minute hollow tentacles, which are visible only under a microscope. One of these minute tentacles appears to be placed on an inter-articular portion placed between the extremities of the internodes. The cells are small, cup-shaped, with petaloid unarmed apertures which are directed upwards. The vesicles are situated in the axilla of the branchlets, or where they arise from the stem, they are pear-shaped, rather small, sessile with contracted subterminal apertures. In specimens washed on shore, the branchlets are commonly broken off or much injured, those taken in trawl nets have them about the sixth of an inch in length, while those from deep water which have been brought up by the hook, very frequently have them three quarters of an inch in length.

#### FLUXULARIA. Lamour.

**Generic Character:** Plant-like, rooted, single or branched; the shoots or offsets pinnate: cells axiserial, small, sessile, unilateral, usually seated in the axilla of a horny spine; vesicles scattered, unilateral. Polypes hydraform.

The general appearance of this genus is the same as that of *Sertularia*; but it is distinguished from it by having only one row of cells on the pinnæ.

\* *Stem a single tube.*

**SICKLE CORALLINE.** *P. falcata*. Stem waved, branched, alternately pinnate; cells crowded in a single row, with plain apertures, tubular, slightly bulging at the base.

*Corallina muscosa pennata, ramulis et capillamentis falcatis*, Rasi, Synop. Stirp., vol. 1, p. 36, no. 16. *Sickle Coralline*, Ellis' Cor., p. 12, pl. 7, fig. a A, pl. 38, fig. 6. *Sert. falcata*, Ellis and Solander's Zooph., p. 42. *Turton's Lin.*

teral, closely arranged, bulging at the base, contracted at the neck, with unarmed apertures pointed at the outer margin, and are situated on the branches and pinnæ only. The cells on each internode of the pinnæ are crowded together and in contact; but where the internodes join, there is a vacancy, so that they look as if congregated into parallel companies, similar to what occurs in the genus *Serialaria*. A variety frequently occurs in the distribution of the cells which present the appearance of being arranged in a double row. This is produced by the cells, instead of being arranged in a close straight row, being made to lie alternately on either side of a median line, much in the same way as if the teeth of a saw were bent alternately in opposite directions. The vesicles are pear-shaped, furrowed, with contracted tubular apertures, pedunculated, and irregularly distributed.

Ellis has given a very good figure of this species, in the centre of the curious frontispiece to his Essay on Corallines. The figure at pl. 7 is not so good either as that, or the one at pl. 38, fig. 6, which he sufficiently explains, by saying it was taken from a dried specimen. Dr. Grant, as quoted by Johnston, represents the terminations of the stems in this species, as being open during growth; a remark which my opportunities do not enable me to confirm.

**PODDED CORALLINE.** *P. Cristata*. Stem simple, plumous; pinnæ alternate; cells unilateral, in a close row on the upper side of the pinnæ; apertures large; margins deeply dentated, with a prominent spine, inferior to the rim; vesicles barrel-shaped, with serrated ribs. Pl. viii.

The Podded Coralline, Ellis' Coral., p. 13, no. 12, pl. 7, fig. b B. Sertularia pluma, Ellis and Solander's Zooph., p. 43. Turton's Lin., vol. 4, p. 679. Stewart's Elem., vol. 2, p. 443. Aglaophenia pluma, Lamouroux's Coral., Flex., p. 170. Plumularia pluma, Fleming's Brit. An., p. 546. Plumulata cristata, Templeton in Mag. Nat. Hist., vol. 9, p. 467. Johnston's Brit. Zooph., p. 143, pl. 19, figs. and 3, pl. 20, fig. 1.

**Hab.** On Ascidia, Fuci, Pinna ingens, oysters, stones, from one to fifty fathoms of water, very common. Polperro, Looe, Seaton, Goran, Port Loe, &c.

This common and delicate species is attached to the substances on which it grows by means of brown, creeping, tubular fibres, which trail irregularly in all directions, and send off plumous shoots from one to three and half inches high, irregularly throughout its course. The stem is polished, jointed, of a dark brown, and frequently almost of a black

colour. The pinnæ are of a lighter colour, alternate, closely arranged in pairs on each internode, and vary from one eighth to two thirds of an inch in length. The cells are uniserial, crowded, and cup-shaped; the apertures, patulous, deeply notched with about eight indentations, and at a short distance beneath the rim is a stout rounded spine. Each cell rests on a separate internode of the pinna. The vesicles, though liable to much variation, have all a very peculiar and characteristic appearance, resembling minute barrels, embraced with from five to nine serrated ribs. They are quite transparent when living, allowing their irregularly shaped ova to be seen through the sides; but when dry, they become opaque and of a pearly hue. They are generally attached to the pinnæ throughout their length by a dorsal band. This band is sometimes free and arched, and the vesicles attached only at the extremities. The circular ribs have sometimes only one prominent serrated rim and at others two.

The description of the cells given above, is taken from such specimens as most nearly approach to the descriptions and figures of authors, more especially of Ellis and Johnston. But there are variations from this standard, too remarkable to be passed unnoticed. In no specimen have I seen the cells so crowded as in Johnston's figure; Ellis' at pl. 7, more closely approaches to the mode of distribution observed in Cornish specimens, but he has omitted the sub-marginal spine; the artist having drawn from an oblique back view, instead of a lateral one, as he himself remarks. In one variety the cells are deeply tubular; the mouth is deeply indented with five, six, or seven teeth; the spine beneath the aperture, is stout, and in those cells on the lower pinnæ, frequently twice as long as the diameter of the cell. Above each aperture and attached to the upper portion of each internode, is a short tubular process which lies across the mouth of the cell; it

**P. PENNATULA.** "Plumose; the pinnæ opposite; cells in a close row, cup-like, with an unequally crenated margin, supported on the under side, by a lengthened incurved spinous process." Montagu.

*Sertularia pennatula*, Ellis and Solander's *Zooph.*, p. 56, tab. 7, figs. 1 and 2. *Aglaophenia pennatula*, Lamouroux's *Cor. Flex.*, p. 168. *Sert. pennatula*, Turton's *Lin.*, vol. 4, p. 681. *Plum. pennatula*, Fleming's *Br. An.*, p. 546. Johnston's *Brit. Zooph.*, p. 145, pl. 8, figs. 1 and 2.

*Hab.* On *Pinna ingens*, from deep water, off Deadman point, very rare.

This is so rare a species, that I have met with but one specimen. In its general appearance it approaches very closely to the Podded Coralline; from which however it is very readily distinguished. The stem is divided into joints, each bearing two pinnæ; the pinnæ are closely arranged, waved and opposite. The cells are unilateral, on the inferior edge of the pinnæ, one on each internode; they are small, cup-shaped, with irregular patulous apertures, and with a minute denticle on each side; from the base of each proceeds a long tubular spine, which varies in length from two to two and half times the diameter of the cell and rises above it. The specimen procured in the Cornish seas, was not so closely pinnated as Ellis' beautiful figure, but more so than Johnston's.

That variety of the Podded Coralline, which has the lengthened sub-marginal spine, bears a great resemblance to this species. But it is distinguished from it, by the cells being on the upper margin of the pinnæ, deeply tubular, by the regularity and decided manner in which the margin is dentated, and by the spine, though long, projecting from the side of the cell, leaving a space between it and the margin of the mouth, which is not the case in this species.

**SEA BRISTLES.** *P. Setacea.* Plumose; the pinnæ alternate, one on each internode of the stem, rising near the joint on a slight protuberance; cells distant, cup-shaped, with an even margin, resting on an enlargement of the branch, with two minute teeth between each; vesicles elliptical, smooth.

Sea Bristles, Ellis' *Coral.*, p. 19, pl. xi., no. 16, a A., tab. 38, figs. 4, d.t. *Aglaoph. setacea*, Lamouroux's *Cor. Flex.*, p. 172. *Sert. pinnata*, Stewart's *Elem.*, vol. 2, p. 446. *Sert. setacea*, Turton's *Lin.*, vol. 4, p. 683. *Plum. setacea*, Fleming's *Brit. An.*, p. 547. Templeton in *Mag. Nat. Hist.*, vol. 9, p. 467. Johnston's *Brit. Zooph.*, p. 146, pl. 18, figs. 3 and 5.



*Hab.* On shells and stones from deep water, common, from Falmouth to Plymouth.

This species varies from one to six inches in height, and is delicate and drooping when large. The trunk is divided by septa, between each of which are placed one or two rings of an inter-articular substance, which is well figured by Johnston; each internode gives off one pinna at its upper end, which rests on a protuberance of the stem, and gives it a waved appearance. The joints of the pinnæ are also separated by the inter-articular rings. The cells are distant small, cup-shaped, situated on a protuberance of the internode, and their apertures are plain and even. Between the cells are two minute hollow teeth, visible only under a high magnifier.

Dr. Johnston, in his references, has not considered that Ellis' figure, pl. xi., no. 16, a A, refers to this species; or at least he has not referred to it, as he has to the figure at plate 38. But no. 16, at plate xi., is a very good likeness of those I have found growing on shells on this coast, and figure A, appears to be a magnified representation of the same; though Dr. Johnston thinks both refer to *Plumularia pinnata*: in *P. pinnata*, the pinnæ arise from each internode, and the vesicles are strongly toothed, while in *P. setacea*, as in Ellis' figure, there is only one pinna arising from each internode. Dr. Fleming has united them under one name. There appear to be three varieties of this species which has probably given rise to this confusion.

The first variety, the longest with the shortest pinnæ, is figured by Johnston at pl. xviii., figs. 4, 5, and generally grows on stones:

The second, on shells, feather-like in appearance, and like the figure of Ellis' at pl. xl., no. 16, a, on which I have found abundance of vesicles like those figured surrounding the



*Hab.* On shells, and on the back of the Corwich crab, common. Polperro.

This delicate species is commonly found about from one to two and half inches high, "but sometimes attains the height of four inches." It is of a delicate straw colour throughout, but the pinnæ are rather lighter than the stalk. The stalk is divided at regular intervals into joints, is smooth and destitute of cells. The pinnæ are alternate and arise in threes from each internode, though I have seen specimens in which they arose in pairs. Each pinna arises from an enlargement of the stem, and like the stem, is divided into joints. The joints or internodes are about five or six times as long as their diameter and irregularly waved. The cells are transparent, unilateral, small, distant, cup-shaped and lying on enlargements of the internodes their apertures are patulous and even. Between the cells, one on each internode, is a minute curved denticle, with its convexity turned upwards. The vesicles are sometimes very numerous produced, and are axillary; when young, ovoid; but when the gemmules are fit for expulsion, the upper part bursts into deep indentations, giving the appearance, as Ellis says, of being "divided like a coronet."

This species very closely resemble *P. setacea* in general appearance and shape of the cells; but is distinguished from it by having three pinnæ on each internode of the stem instead of one; and by having only one denticle between the cells instead of two.

**PLUMULARIA CATHERINA.** "Stem plumous, the pinnæ opposite, bent inwards; cells distant, campanulate, with an even margin; vesicles scattered, pear-shaped, smooth." Johnston.

*Plumularia Catherina*, Johnston in *Mag. Nat. Hist.*, vol. 6, p. 498, figs. 61, 62. *British Zooph.*, p. 147, vignette no. 8, p. 79, p. 148, fig. 16.

*Hab.* On Pinna ingens, in deep water five leagues off the Deadman; common.

This is the most slender of all the species I have seen. Its pinnæ are opposite, and "instead of being arched bend inwards, so as to render the general form of the coralline concave on a front view, an appearance produced by the pinnæ originating not from the sides, but from the anterior face of the stem." *Johnston.* The cells are minute, cup-shaped, situated on an enlargement of the internodes of the pinnæ; and between the cells are numerous minute hollow teeth, visible only under a very high magnifier. The vesicles are pear-shaped, with a contracted mouth frequently

covered by a bit of spectrum. I have found it growing profusely in the bottom of a vessel which had been lying in Fovey harbour for some months. This species was first described by Dr. Johnston and figured by his lady, and in honour of her is called "*Catherina*."

"Stems composed of many parallel tubes.

**PHEASANT'S-TAIL CORALLINE.** *P. Myriophyllum.*

"Clustered, the stems unribbed, beaked at distant intervals, pinnate; pinnae leaning to one side; cells shortly tubular, seated in the axilla of a curved spinous process, the aperture wide and nearly even." PL. ix.

Pheasant's-tail Coralline. Ellis' Coral, p. 14, pl. 3, no. 10, fig. a. A. Aglaoph. myriophyllum, Lamouroux's Cor. Flex., p. 163. Serp. myriophyllum, Turpin's L'ill., vol. 4, p. 678. Ellis and Sclander's Zooph., p. 44. Stewart's Elem., vol. 2, p. 443. Plum. myriophyllum, Fleming's Brit. An., p. 547. Templeton in Mag. Nat. Hist., vol. 9, p. 455. Johnston's Brit. Zooph., p. 143, pl. 19, figs. 4, 5.

*Hab.* "On the back of the spider crab, and on a slab of limestone." Goran, Mr. Peach.

This beautiful coralline is of rare occurrence in our seas. I have never procured a specimen myself, but Mr. Peach has kindly favoured me with three from deep water off Goran, one of which is remarkably fine, measuring six and half inches in height; from these I have taken the following description. The polypidom is stout, erect, and of a yellowish horn colour. The trunk is stout, composed of many sub-parallel tubes agglutinated together; marked on the back, at intervals of from a quarter to one inch, with protuberances, as if it was composed of internodes, which overlapped each other at their extremities: the overlapping parts are united

slightly pointed on the outer, and waved on the lateral margins.

Ellis states that his specimen had no ovarian vesicle and that he had never seen any; Johnston, Lamouroux and all other authorities to whom I have access do not mention them, and the specimens I have are without any, so that at present they appear to be unknown.\*

**SHRUBBY CORALLINE.** *Plumularia Frutescens*. Stem dark brown, composed of sub-parallel tubes irregularly branched, branches pinnate, pinnæ alternate, bifid; cells distant, ovato-tubular with plain and slightly everted rims; vesicles ovoid, smooth, with small terminal apertures.

*Sertularia frutescens*, Ellis and Solander's *Zooph.*, p. 55, pl. 6, fig. a A, pl. 9, figs. 1, 2, covered by an *Alcyonium*. Turton's *Lin.*, vol. 4, p. 680. Stewart's *Elem.*, vol. 2, p. 445. *Plum. frutescens*, Fleming's *Brit. An.*, p. 547. Johnston's *Brit. Zooph.*, p. 149, pl. 20, figs. 2, 3. *Aglaophenia frutescens*, Lamouroux's *Cor. Flex.*, p. 173.

*Hab.* On stones from deep water, from the Eddystone to the Deadman. Common, but not abundant.

This species is of a dark brown colour and varies from one to five inches in height. The stem is composed of aggregated sub-parallel tubes of a dusky brown colour, and not polished. The pinnæ are closely arranged, formed of single tubes and bifurcated, with one cell on each internode. The cells much resemble old fashioned coffee cups, with patulous apertures having slightly everted rims. They lie close to the pinnæ, and are lodged in a slight cavity of the internode, with a transparent triangular denticle between each. Sometimes they are much branched and bushy, but most commonly are only a simple frond. The vesicles are numerous produced in March and April, on the upper edges of the pinnæ. They are small, ovoid, with prolonged terminal apertures.

LAOMEDEA. Lamouroux.

*Generic Character:* Polypidom rooted by a creeping fibre, plant-like, erect; jointed at regular intervals, the joints ringed, incrassated, giving origin, alternately on opposite sides, to the shortly pedicled cells; cells campanulate; vesicles axillary. Polypes hydraform.

**SEA THREAD CORALLINE.** *L. Dichotoma*. Stem filiform, branched dichotomously; cells alternate campanulate, the rim even.

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\* The vesicles of this species have since been seen by the Rev. D. Lansborough of Ayrshire, he says "they are as remarkable as those of *P. Cristata*," but does not describe them. *Zoologist*, vol. 1, p. 88.

Sea thread coralline, Ellis' Coral., p. 21. pl. xii., no. 18, a A. Sert. dichotoma, Ellis and Solander's Zooph., p. 48. Turton's Lin., vol. 4, p. 682. Stewart's Elem., vol. 2, p. 446. Campanularia dichotoma, Fleming's Brit. An., p. 548. Grant's Comparative Anatomy, 10, fig. 5. Cyclop. of Anatomy and Physiology, p. 108, fig. 30. Templeton in Mag. Nat. Hist., vol. 9, p. 469. Laomedea dichotoma, Lamouroux's Cor. Flex., p. 207. Johnston's Brit. Zooph., p. 150, pl. 22, figs. 1 and 2.

*Hab.* On stones from deep water, common; in pools about low water mark; in Whitsand bay, Looe, Polperro, near Fowey, and Goran; common. On sponges, rare.

It grows to the height of from six to ten inches, but is more commonly about one. The appearance of this species is confervoid. It is of a light transparent horn colour, rooted by minute tubular fibres; erect and dichotomously branched. The cells are campanulate, biserial, on annulated footstalks a little longer than the depth of the cell; the apertures are even and unarmed. The whole polypidom is divided into long internodes, and the branches at their origin are annulated, and those parts of the stem and branches which give support to the cells are enlarged into kneed protuberances. The vesicles are ovoid, or urn-shaped and axillary. The ova are numerous and composed of two parts, a central dark nucleus and a light surrounding zone. Beside this there are some curious phenomena connected with the gemmules, which are not mentioned here, because the nature and character of them are exceedingly obscure: Sir J. G. Dalyell has also noticed them, but not explained them; they are therefore retained for further consideration. Ellis says it "seems most curiously contrived, from its structure, to resist

*Hab.* On floating fuci; on fuci near low water mark; on the under surface of stones in brackish water; gregarious; abundant through the year.

This small species varies from half an inch, to one inch in height, and is liable to variations in colour from a white to a deep red. It is gregarious on almost all the larger sea weed, about the tide marks, especially the *Fucus serratus*. It is rooted by small creeping tubular fibres, which trail along the surface of the substance on which it grows and gives off new polypidoms at irregular intervals in its course. It is erect and sparingly branched, the stem is zig-zag and divided into joints. At the upper extremity of each internode is an enlargement, on which rests a ringed peduncle which bears the cell. The peduncle is composed of from four to six annulations. The cells are campanulate with even unarmed apertures. The vesicles are axillary, vasiform, and are to be found throughout the summer. The horny sheath of this and the following species, is so transparent, that the central granular pulp, and the polypes with their tentacula may be distinctly seen through its sides. The number of tentacula varies from fourteen to twenty eight.

Some of the finest specimens I have seen were growing on the dorsal and caudal fins of a Picked Dogfish.

**L. GELATINOSA.** "Subordinate branches dichotomously branched; cells on twisted footstalks, campanulate, with even margins." *Ellis*. Pl. x.

*Fucoides setaceum tenuissime alatum*, *Raii*, *Synop. Stirp.*, vol. 1, p. 38, no. 6, pl. 2, fig. 2. *Corallina filiformis ramosa pedunculis calyculorum contortis*, *Ellis' Coral*, pl. 38, fig. 3, p. 23, pl. 12, fig. c C. *Sert. gelatinosa*, *Stewart's Elem.*, vol. 2, p. 444. *Campanularia gelatinosa*, *Fleming's Brit. An.*, p. 549. *L. gelatinosa*, *Johnston's Brit. Zooph.*, p. 152, pl. 21, figs. 3 and 4, pl. 23, fig. 1.

*Hab.* On stones near low water mark and in pools. *Polperro*; common.

"This species" *Johnston* says "in its most perfect state rises to the height of eight or ten inches." But it is more commonly found about one, and so closely resembling the last that it will be best described in connection with it. In the habit and mode of growth there is but little distinction. In this the stem is more waved, not so zig-zag, and more slender; the cells are larger and deeper; the footstalks longer and not situated on any swelling of the stem. The vesicles are vasiform, axillary, and on ringed footstalks. The manner in which the gemmules are produced differs. In the last species the whole of the granular pulp is formed into the gemmules, then they escape, leaving the case empty; in

this there is a central placental column to which the gemmules are attached by an umbilical cord.\* The polypes are alike in both, and are liable to the same variations and irregularities in the number of their tentacula.

This species is sometimes abundant under large stones between tide marks, in sheltered situations, on sea weed and other marine productions, and is more abundant than I had previously suspected.

This is said to grow to the height of eight or ten inches, but is more commonly found about one. It is very slightly branched, much resembling the "knotted sea thread," from which it is not at all times easy to distinguish it; but the twisted or ringed foot-stalks to the cells are longer, and not placed on enlarged parts of the stem, as in that species. "The cells are deeply cupped, transparent, with a wide even margin." The vesicles are urn-shaped, axillary and smooth.

#### CAMPANULARIA.

*Generic Character:* Polypidom rooted, creeping, or when compound erect, the main tube filiform, continuous, giving off its pedunculated cells irregularly or in whorls; pedicles frequently ringed, usually long; cells campanulate; vesicles scattered, sessile. Polypes hydraform.

\* *Stem a single tube.*

**SMALL CLIMBING CORALLINE.** *C. Volubilis.* Stem creeping, tortuous, filiform; cells bell-shaped, with serrated rims on long slender ringed foot-stalks; vesicles irregularly ovoid, corrugated.

Small climbing Coralline, with bell-shaped cups, Ellis' Coral., p. 24, no. 21, pl. 14, fig. a A. Sert. volubilis, Ellis and Solander's Zooph., p. 51, pl. 4, fig. e, f, E. F. Turton's

gins, on long slender foot-stalks ringed in two places, at their origins and near the cells; but the animal possesses the power of corrugating the whole, and making it look annular, as in the figure of Ellis and Solander tab. 4, E. F. These ringed foot-stalks arise in an alternate manner from a hollow creeping horny tube; variously twisting over the substance on which it grows. The vesicles are ovoid, but very much corrugated transversely, and arise from the creeping trunk on a short foot-stalk. Polypes with twenty tentacula of a light colour.

**CREEPING BELL CORALLINE.** *C. Syringa*. "Stem creeping, capillary; cells on short twisted foot-stalks," deeply tubular, with plain even apertures.

Creeping bell Coralline, Ellis' Coral., p. 25, pl. 14, fig. b B. *Sert. syringa*, Turton's Lin., vol. 4, p. 680. Stewart's Elem., vol. 2, p. 444. *Sert. repens*, Ellis and Solander's Zooph., p. 52. *Clytia syringa*, Lamouroux's Cor. Flex., p. 203. *Campanularia syringa*, Fleming's Brit. An., p. 548. Johnston's Brit. Zooph., p. 155, fig. 18.

*Hab.* On the antennæ of the spider crabs, and on the remains of old corallines in company with the small climbing coralline. Polperro, Goran, Fowey, Whitsand and St. Austle bays.

In consequence of the minute size of this and the last species, it is necessary to examine them with a microscope to discover their specific differences. They most commonly grow together, but this is distinguished by the shortness of the ringed foot-stalk to the cells; the depth, tubuliform character, and stoutness of the cells. The apertures are not patulous and are plain and even, while those of the last are serrated.

**CAMPANULARIA INTERTEXTA.** *R. Q. C.* Texture spongy, composed of single tubular fibres very much interwoven with each other, not ringed; cells campanulate; apertures even. Pl. xi.

This which is I believe quite new, differs so remarkably from any of the kindred species, that it cannot easily be mistaken. It so closely resembled a very loose textured sponge, that several specimens were laid aside for a time, till that class came under consideration. I have found many specimens encrusting the *Sertularia polyzonias*, *Campanularia dumosa* and other corallines from deep water about seven leagues from the Deadman, in a line S.E. to S.S.W. It encrusts or surrounds the stem and branches for about half an inch in length; it is ovoid and formed of minute brown hollow tubes variously intervoven. The cells, which are



minute, stand a little from the surface, and are campanulate with even truncated apertures. I have been unable to refer this to any described species, and have therefore proposed to call it *intertexta* as descriptive of its appearance. As the peduncles are not ringed, it has been necessary to make a slight alteration in Johnston's generic character for its reception.

**CAMPANULARIA LÆVIS.** *R. Q. C.* Arising from a creeping fibre; cells distant on long slender unringed footstalks, campanulate with patulous even apertures. Pl. xi.

*Hab.* On stones and shells from deep water, Polperro.

This species is by no means uncommon, but to be seen must be examined in water while recent. It arises from a creeping fibre at irregular intervals, the footstalk is long, slender and dilates gradually into the cell; the cell is campanulate with a patulous and an even aperture, the polype has eleven long and slender tentacula.

It somewhat resembles the *Clytia urnigera* of Lamouroux pl. 5, fig. 6, but the cell does not swell so much, nor is the aperture so contracted as in that species.

• • *Stem composed of many parallel tubes.*

**HORSE-TAIL CORALLINE.** *C. Verticillata.* Poly-pidom erect, tapering, branched; cells on long foot-stalks, arranged in a verticillate manner at regular intervals, funnel-shaped, with notched rims. Vesicles ovoid, on short peduncles, with small even apertures, rising from the trunk.

Horse-tail Coralline, with bell-shaped cups, Ellis' Coral, p. 23, no. 20, pl. 13, fig. a A. Sert. verticillata, Ellis and Solander's Zoonh., p. 50. Turton's Lin., vol. 4, p. 679.

*Campanularia dumosa*, Fleming's Brit. An., p. 548. Johnston's Brit. Zooph., p. 157, pl. 23, figs. 2, 5.

*Hab.* On stones, shells, and corallines; common.

The species varies so much in its general appearance, that specimens are frequently totally unlike each other. Sometimes it stands erect to the height of four inches and is very much branched; at others it creeps along the surface of a stone or shell and nothing but the cells are visible; and frequently it creeps up the stems of the *Sertulariæ*, the cells standing in relief irregularly round them. When erect and branched, it is somewhat bushy, and the trunk and branches are square. The cells, which are nearly sessile, stand in relief from all parts of the polypidom, as small linear tubes. But whatever shape it may assume, it is at all times readily distinguished by its cells; they are of a deep brown colour, deeply tubular and tapering towards the base; they are much stouter than any other of the genus, and the apertures are even, and unarmed, and the rim patulous and everted, like the aperture of a bugle.

#### CYMODOCEA. Lamouroux.

*Generic Character:* "Plant-like, cells cylindrical, varying in length, filiform, alternate or opposite; stem fistular, marked with rings below, plain above, and without interior division." *Lamouroux.*

**CYMODOCEA SIMPLEX.** "Stems simple, more or less waved, twig-like; cells alternate, long, and filiform; yellow fawn colour."

*Cymodocea simplex*, Lamouroux's Cor. Flex., p. 216, no. 357. Johnston's Brit. Zooph., p. 158.

I have obtained several specimens of this species, or something very nearly resembling Lamouroux's magnified figure, at pl. vii., figs. 2, B, though unlike his figure of the natural size; and I am satisfied that all were nothing more than injured specimens of *Laomedea Gelatinosa*.

As this genus of Lamouroux contains only three species, each of which has a very doubtful existence, it may be entirely discarded.

#### ORDER II.

#### ASTEROIDA

The second order of British Zoophytes embraces but a few species, but offers considerable variations in character and appearance from any of the others. In the order last described, as also in the *Helianthoid* and *Ascidian* zoophytes, the polypidom or hard part is external, while in this it is

situated interiorly: the exterior being occupied by the polypes and the fleshy crust. The general appearance of the order varies a great deal in the different families, each being dissimilar from the others; one is palmate and arborescent, another crustaceous and lobulated, and another plumous and linear elongated; but they may all be readily known by having eight-rayed starred depressions distributed over the surface. The character of the order is: *Polypes compound, mouth encircled with eight fringed tentacula; stomach membranous with dependent vasculiform appendages at its base; anus none; intestine none; reproductive gemmules produced interiorly. Polypidom, when existing, internal, horny or calcareous, free or rooted; polype mass arborescent, lobed or plumous; external crust fleshy, marked with star-shaped depressions of eight rays, for the polypes.* All the species are compound, or composed of an aggregated series of polypes. The British species are distributed over the three families of *Gorgoniadæ*, *Alcyonidæ* and *Pennatulidæ*, of the last of which no species has yet been found in the Cornish seas; though Bellamy in his Natural History of South Devon mentions that *Pennatula phosphoreæ* has been found in Devon by Turton.

The Cornish species of the order, therefore divide themselves into two very natural groups; the *Gorgoniadæ*, being arborescent with an internal horny axis; the *Alcyonidæ*, encrusting or lobulated and destitute of an axis.

The form of the polype is common to the whole order and is the part by which it is characterized. In its expanded state it is a transparent truncated cone; having its base towards the polypidom, and the truncated extremity raised and surrounded by eight fringed tentacula. The sides being transparent, allow all the internal organs to be seen, and this transparent membrane is composed of two layers,

beneath. This orifice is surrounded by eight filiform appendages, which hang loosely into the abdominal cavity. Dr. Johnston says they "have generally been considered ovaries"\* but he, as well as Grant and Edwards, doubts such a supposition, and considers them as subservient to the process of digestion; which so far as my observations go, seems the most reasonable opinion. I have kept many in confinement, and watched others from the sea at all seasons, but have never seen these organs develop any thing resembling ova, which are known to be plentifully developed in other parts. The abdominal cavity, which occupies by far the largest portion of the polype, opens into the cell, which in its turn, opens into the tubes which traverse the fleshy crust.

When the polypes of the whole polypidom are fully expanded, the sight is among the prettiest that can be imagined, and more nearly resembles some aquatic Cactus in full bloom with transparent flowers, than a production of the animal kingdom.

Each polype, though exercising its functions as an independent being, is associated with all the others in the nourishment of the polype-mass. Beside this community of nourishment, there is also a community of feeling existing between the polypes; so that in recent and healthy specimens, any irritation made on one is perceived by all, and a gradual withdrawal into their cells is the consequence. If, however, the specimen has been sometime removed from the sea, and not frequently supplied with good water, their powers of perception and action are considerably lessened, and they finally die in the expanded state.

The polype itself is exsertile, and when expanded may be said to be in a natural state. In describing the transparent tunic forming the outer wall of the polype, it was mentioned that it separated into two layers at the rim of the cell; this point of separation forms the base on which the polype rests in its expanded condition. When it has retreated within its cell, the transparent tunic becomes invaginated "like the contracted horns of a snail," or like a partial inversion of the finger of a glove; and the edges of the cells are also drawn together into the star shaped depressions so characteristic of the Order.

The first of the two groups which occurs in Cornwall is the *Gorgoniadæ*, of which two species only inhabit our shores; a third, which was found by Dr. Borlase in Mount's bay, must be noticed as having occurred, but it was most probably foreign and cast on shore from some ship. The only species

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\* Mag. Zool. and Bot., vol. I, p. 239.

I have ever procured is the common Sea Fern, *G. verrucosus*, which is every where abundant. This species presents a great variety of form, two of which induced the late Mr. Sowerby to elevate them into distinct species, but for this there does not appear to be sufficient reason, as the variations most probably depend on the localities in which they grow.

The general appearance of the *Gorgominda* is stout, irregularly arborescent, netted, and more or less palmate or fan-shaped. They are composed of three distinct parts, which, although it is necessary to separate in description, are inseparably united to each other in a physiological relation, and constitute together the perfect animal. The parts are the crust or bark, the horny axis, and the central pith. The fleshy crust is always external and warted; when living, it is soft, fleshy, and of a light vermilion colour, which in death becomes very friable and changes to a yellowish white. It is covered more or less thickly and irregularly with small wart-like prominences, which have on their summits the star-shaped depressions for the polypes. The depressions have eight rays, answering to the number of the tentacula; but the circumference of the star is very frequently encroached on for about a fifth of its extent by a fleshy lip which obscures several of the radii. The cells resemble an inverted cone in shape, and are smooth and white. The broadest part of the cone forms the aperture of the cell in the expanded state, and the apex is tubular and continued through the crust in an oblique downward and inward direction till it reaches the horny axis. The tubes vary in length according to the thickness of the crust, but do not inosculate as in the *Alcyonium*; after having reached the axis they pierce the membrane of the crust which lies in contact with the membrane of the axis, and pass beneath this membrane

be found to be composed of light and dark lines, formed by large numbers of irregular cellular bodies arranged longitudinally in various degrees of aggregation. When separated from each other, these cellules present one general lengthened form, terminating at either end in a point, at the base of which is a rim, resembling the neck and pointed stopper of a decanter. Between the two extremities, the body is straight, but has minute globular cells arranged sometimes in pairs, at others irregularly, and occasionally in rings round it. If allowed to undergo still further decomposition, these separate into smaller bodies of the shape of a Florence flask, which under still further decomposition, separate into minute globular cells, which form the ultimate component parts of the whole crust. Their union is of the most intimate kind, and before decomposition has begun, it is impossible to detect the points of union between them. Ellis, in his "Essay" on Corallines, has given a figure of a perfectly organized cell of the *G. Placomus*, which differs but slightly from those of the *G. Verrucosa*; but most probably they differ in every species.

The polypidom of the *Hydroida*, we have seen is external, but here a new and remarkable change has taken place, and it has become the internal solid skeleton which gives form and consistence to the whole. It is covered from the root to all the branches with an investing membrane, similar to the periosteum of bones. This membrane, which is fibrous, is not equally demonstrable at all seasons of the year, or in all specimens. Though this appears to be independent of seasons, yet I have found it more clearly apparent about September, October, and November, or at least my notices more frequently refer to these than any of the other months. At those periods it is frequently so very loose that it may be stripped off; in the branches it is sometimes detached from the axis, and elevated into large cavities which are partially filled with a white granular matter; a section of these cavities therefore presents, first, the fleshy crust with its proper membrane, then, the investing membrane of the axis raised in contact with the crust, the white granular matter, and the surface of the axis itself. Under the microscope, this membrane appears striped and perforated with oval openings; on one or two occasions, in which the membrane was more than usually unattached and fine, the stripes appeared to be composed of cellules similar in shape and arrangement to those described in the membrane of the fleshy crust. The oval openings are continuous with the tubes of the polypes and the rugæ of the axis, and doubtless serve for the transmission of matter to the horny stem. This investing sheath is frequently so obscure as to bid defiance to a separation from its attachments; at this time the rugæ generally are absent and



the surface of the axis dark, and polished. Ellis has made observations similar to these on this genus\*, which have not been allowed to have their due influence in the formation of the theories of some of our physiologists.

The axis is solid, horny, fibrous, flexible and formed by a series of concentric layers. It varies in thickness according to age, and is more solid in the older portions than in the branches which are of a horny membranaceous texture. Though the thickness of the axis is in accordance with the age of the specimen, yet it depends for its existence on the soundness of the fleshy crust. For if from accident or the incrustation of corallines, the axis be denuded, it ceases to increase, while above and below the point of denudation it grows as usual. In a transverse section the concentric layers, in lighter and darker lines, are very observable, with the white central pith. This view bears a great resemblance to a similar section of the wood of an exogenous plant, but presents two remarkable deficiencies in the absence of the radiating medullary rays and cells which render the wood such a beautiful object for the microscope. The axis near the root is very compact and the circular layers consequently less distinct than higher up; in the branches it is merely membranaceous. In a longitudinal section the concentric layers are as apparent as in the transverse one and it very closely resembles a similar section in wood. It is fibrous and rends very freely. In different parts of this section white spots of a cellular substance are frequently observed irregularly distributed between the horny layers. This is most frequently observed about the root in the axillæ of branches, especially where two arise close to each other. In such a case I have frequently seen several successive layers of it with a few of the horny fibres be-

of the branches, it is certainly not the case, as the deposit is recent and the crust entire; in the axillæ of the branches it is very common to find several successive layers of the same so regularly deposited as to preclude the idea of such a fortuitous enclosure. This opinion, therefore, of Ellis's, appears to be erroneous, but is rather an error of deduction than of observation. In the lower portions of the stem and in that part near the roots, the cavities are frequently hollow or without any of the white matter; some are only partially empty, while in all the newer parts they are filled; on this point a very important question arises: Were these empty and partially empty cavities ever occupied by the white matter? If not, they differ from the more recent and superficial ones: If so, in what manner has it been removed? questions which very materially affect the doctrine of the inorganic nature of the axis. I consider these cavities to have been filled like the more recent ones and that the matter afterwards became absorbed. From this it will be seen that I am an advocate for the organic nature, and life of the axis; an opinion that will be further supported hereafter. I am quite aware that the opposite opinion is held by Dr. Johnston, but with all respect for such high authority I confess that his facts and arguments are not of sufficient weight to make me alter my views; for the residual phenomena, for which his theory fails to account, are so great and important as to throw a very considerable doubt over it at least. Dr. Johnston quotes Lamarck as saying that the axis under all its modifications is inorganic and formed by matter excreted from the polypes, which afterwards become solidified by affinity, this however is the result of theory rather than observation and can therefore have no weight when opposed to facts.

The pith is central, white and runs through the trunk and branches; and is smaller and more compressed in the older than in the newer parts. Many persons, from the position and distribution of the pith taken in connection with the concentric layers of the axis, have considered it a vegetable stem. But there are several important discrepancies between the pith of a *Gorgonia* and an exogenous stem, which have been noticed both by Ellis and Johnston. In vegetables the pith is continuous from the trunk through all the branches and is surrounded by a ring of vessels composed of tracheæ and ducts; in the *Gorgonia* it is not continued from the trunk through the branches, but each offset is separated by several layers of horny fibre and is in no way connected with the pith of the trunk. It is also divided at short intervals, in the *Gorgonia*, by transverse septa, and the branches appear as if



grafted on the trunk; neither has it the zone of vessels so constant in the vegetable pith. In a transverse section of a recently formed part, the pith is found to be composed of irregularly sized cells quincuncially arranged; and in a longitudinal one, of cells very similar to those described as being found in the membrane of the crust, but smaller and whiter. It diminishes in size with age; in the youngest branches it is nearly twice as large as in the trunk; and near the root it is entirely absent; in an examination by the microscope, the newer portions are very apparently cellular, while the older parts, though of the same structure, appear as if destitute of the cells, from their being so closely pressed together by the surrounding horny texture.

The pith is the first part developed in the formation of new branches. The branches are formed irregularly on all parts of the axis, on the old as well the new portions, though most abundantly on the new. The mode in which the formation goes on, is best observed in a longitudinal section. This curious and important point I have examined in a great variety of specimens, old and young, in sections of all parts and at all seasons of the year. The first appearance of a branch is the formation of a white speck of medullary matter, similar in texture and appearance to the pith, and separated from the pith of the trunk by a few layers of horny fibre. At first, this spot is very small, but it soon enlarges and becomes triangular, having its base towards the centre and its apex towards the surface; it increases in size, and that portion of the axis that lies between the apex and surface becomes less till the point reaches the investing membrane; this is prolonged before it into a pointed prominence and constitutes the first outward mark of a branch. How the first point is formed I have been unable to determine, but it is evidently the result of an action

union is found not to exist only at the fleshy crust, or at the edges of the horny axis, but throughout the extent of the opposing surfaces. In some cases the union has taken place as soon as the branches came in contact; in others, and by far the most numerous, the axis has been rubbed half through and then united. On one occasion one branch had become interweaved with three others, and where they touched they became united in the crust and surfaces of the worn axis. So that the axis must, I think, be allowed to possess a vital power, a power which enables it to form new branches in its own texture and to unite any points which may have been made bare by the friction of others. If the axis be inorganic and extravascular, these phenomena are to me inexplicable.

The axis is frequently denuded for a considerable extent, either from accident or the incrustation of Corallines. From the soft and uneven nature of the crust it is very liable to be infested with parasitic animals, such as the *Cellepora pumicosa*, many species of *Sertularia* and *Tubulipora*; different kinds of *Lepades* of which the *L. Scalpellum* seems to prefer it to any other situation.

The *Gorgoniadæ* are always firmly rooted to the rocks and stones on which they grow; and the crust and axis both extend themselves over the surface and produce a firmer rooting. The pith does not extend into the root. The layers of which the expanded root is formed, are more membranaceous, more loosely united, and not so solid as the layers composing the trunk and branches.

The second division, destitute of an axis, comprises the *Alcyonidæ* of which there are three recognized British species, belonging to two genera. One of which, the *Cydonium Mulleri* of Fleming and Johnston, has since been removed from the Asteriod Zoophytes, and placed among the sponges of the genus *Geodia*. In my paper on the sponges of Cornwall, published in the transactions of the Falmouth Polytechnic Society,\* I expressed an opinion that the *Cydonium* would occupy a place between the true and a-polypus zoophytes. Such an opinion was formed from the inspection of only one specimen and was therefore liable to error; but Dr. Johnston in his valuable work on British Sponges is of the same opinion; so that the native species of this division amount now only to two. Under the *Alcyonium digitatum* two species have I think been confounded but will here be found separated as *Al. sanguineum*, from its colour.

The form of the *Alcyonium* is liable to great variations, which are chiefly dependent on the age of the specimen;

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\* Report for 1842.

they may however be reduced to three primary ones, all others being mere variations of them. Each form has a very appropriate name applied to it by the fishermen, which though far from elegant is very expressive. In its youngest state it is merely an encrusting film of about a line in thickness and is called *Sea Scruff*; in the next stage it has become a simple lobe or fingerlike prolongation, and is then called *pape* or *testa*. In its most perfect state it has become large and irregularly lobulated, and is then called *dead man's hands*, or *dead man's toes*. The surface is very coriaceous, filled with small calcareous spiculae, and marked with star-shaped depressions similar to those of the *Gorgonia*. In a longitudinal section of a full grown specimen, the cut surface is found to be composed of a complicated kind of net work with lozenge-shaped meshes. From the cells in which the polypes rest, tubes are prolonged throughout the mass, and freely communicate with each other. Though one tube does not communicate with all the rest, yet there is such an extensive interchange of communication, that such may almost be said to be the case. They open into each other chiefly by im-  
 osculation; but the tubes are perforated in all parts by minute openings which lead into small canals. These canals cross the spaces between the large tubes and join similar canals from other parts; these are also perforated and send off capillary ducts which traverse the meshes formed by the tubes in all direction; this capillary net work is pervaded by the jelly-like flesh of the polype mass which encloses the spiculae described by authors. If coloured water be given to the polype, which will not irritate, it first passes into the stomach and from thence, through the opening at its base, into the abdominal cavity beneath, into the spaces formed by the septa and from thence into the tentacula which then become dis-

gitudinal coat in retaining the tubes to their proper size. The first or inner tunic appears to be of a serous character, and to resemble the lining membrane of arteries; but has this character in addition, that it is the sole seat of reproduction in the order.

The spicula are dispersed irregularly through the substance of the polype mass; near the surface far more sparingly than towards the centre, where they are more closely aggregated. They are very irregular in shape, but yet all possess a character in common. In many cases they closely resemble the bodies described in the *Gorgonia*, and have a similar formation. Some are K-shaped in various disfigurations of its parts. By maceration they readily undergo decomposition, and are then found to have the same cellular composition as the bodies in the *Gorgonia*. The cellules are very closely and intimately connected, yet the connection is readily broken by maceration or weak acids. Though they are thus diffused through the fleshy gelatine with but very little organic connection, yet from their composition they appear to be the result of some vital action. Dr. Johnston considers them as the first appearance of a polypidom or axis, he says "that it would not be difficult to trace them through all their gradations to the horny flexible axis of the *Gorgonia*." Such, from the observations made on the pith and investing membrane of the axis, and the membrane of the crust in the *Gorgonia*, may possibly be the case; but I rather hesitate to consider them similar to the raphides of plants, or the spicula of sponges.

Reproduction occurs in this order only in one way, by the internal generation of gemmules or ova. There is no particular set of organs appropriated to this function as in the higher animals; nor is there, as in the *Hydroidæ*, a periodical developement of ovarian vesicles. The function appears to be of a diffusive kind, and is common to all parts of the lining membrane of the tubes, and according to authorities, to the walls of the abdominal cavity.

The manner in which the ova are developed is best observed in a transverse section. In a natural state the calibre of the tube is circular, but when ova are about to be developed, a segment of the circle is slightly bulged towards the centre. As developement progresses, the bulging increases and becomes more and more circular, till it becomes quite globular and lies on the tube as a tangent. The ovum is held to the lining membrane by an umbilical cord, which is soon clearly to be noticed; this gets more and more attenuated and is finally absorbed or ruptured and the ovum is left at liberty in the tube. From the very earliest period at

which ova are observed to be developed, their surfaces are covered with numerous minute vibratory cilia which are in constant action; these, when the ovum is free, whirl it about in a very rapid manner from one part of the tube to another, and at length into the abdominal cavity. Here it moves about from part to part, sometimes to the orifice at the base of the stomach, which immediately contracts to prevent its escape; at others it wanders into the chambers formed by the septa and to the base of the tentacula, and then again returns to the base of the stomach. At length it passes through the orifice into the stomach, where it is considerably retarded in its action by the contraction and pressure of the gastric surface. After passing the stomach, it escapes by the mouth into the surrounding water. When escaped it appears as if re-invigorated, and moves about with an energy and activity truly remarkable. From the globular form, which they have when they escape, they change first to an oval, but vary in different instances and at different times. The changes are sometimes rapid, and appear almost voluntary; sometimes they are oval, at others they have an hour glass contraction, and occasionally have rounded heads with a tail like prolongation, and thus they vary to an almost unlimited extent. Having at length found a spot on which they rest to become fixed, fibres pass out from the base to serve as roots, and the other parts undergo a remarkable alteration in colour and appearance, becoming more elongated, opaque, and dull, and the flesh appearing on the surface; the horny axis in a very rudimentary state appears before it has attained one line in height; such is the mode observed in the *Gorgoniæ*. The young of the *Alcyonium* differs from this, by diffusing itself into a thin crust. Thus these curious creatures, first moving about with activity

by the mouth, as in the Alecyonium. According to Dr. Johnston, Spix figures the ova united into a bead-like string, which, from their manner of formation is impossible. In this respect also, the figure of the reproduction of the Hydroidæ given by Jones in his "Outlines of the Animal Kingdom" is erroneous.

Though this order can boast but of very few native species, yet further observations will probably find that several have been confounded under one name.

It has been remarked above that no specimen of the Family of *Pennatulidæ*, or *Seapens* has yet been found in our seas; as however an instance has occurred in Devonshire, I here add the *family* and *generic* characters to enable observers on the different parts of our shores, to detect them if any should be taken.

#### PENNATULIDÆ.

*"Polype-mass free, pennated, carnous, the skin spiculiferous; axis bony, simple continuous: Polypes arranged along the margins of the pinne."*

#### PENNATULA.

*Generic Character: "Polype-mass free, plumous, the shaft sub-cylindrical, naked beneath, pennated above; pinne two-ranked, spreading, flattened, and polypiferous along the upper margin."*

#### VIRGULARIA.

*Generic Character; Polype-mass free, linear-elongate, supporting, towards the upper extremity, sessile lunate lobes embracing the stem obliquely, and bearing a row of cells on their margins."*

#### GORGONTADÆ.

Polype-mass fixed, arborescent, the axis covered with a thick cretaceo-gelatinous celluliferous crust; polypes scattered over the whole surface. *Johnston.*

#### GORGONIA. Linnæus.

*Generic Character: Polype-mass rooted, arborescent, consisting of a central brown horny axis, with an external yellow fleshy crust, warty, bearing the polype cells.*

**WARTED SEA FAN.** *G. Placomus.* "Irregularly branched, the branches disposed in a dichotomous order and a flattish form, cylindrical, warty; cells protuberant, conical, surrounded at top by little spines." *Ellis. Pl. 12, fig. 2.*

Warted Sea Fan, *Ellis' Coral.*, p. 67, no. 1, pl. 27, figs. a A, 1, 2, 3. *Gorgonia placomus*, *Ellis and Solander's Zooph.*, p. 86. *Turton's Lin.*, vol. 4, p. 645. *Stewart's Elem.*, vol. 2, p. 430. *Fleming's Brit. An.*, p. 512. *Johnston's Brit. Zooph.*, p. 183, pl. 25, fig. 2.

*Hab.* "Coast of Cornwall." *Ellis*.

"This Sea Fan is of a reddish brown colour;" "has its branches disposed in a dichotomous order and a flattish form, they bend irregularly towards one another, but rarely unite. Their mouths are conical, project, and are surrounded on the top by little spines. The bone or support is nearly of the substance of wood." *Ellis and Solander*.

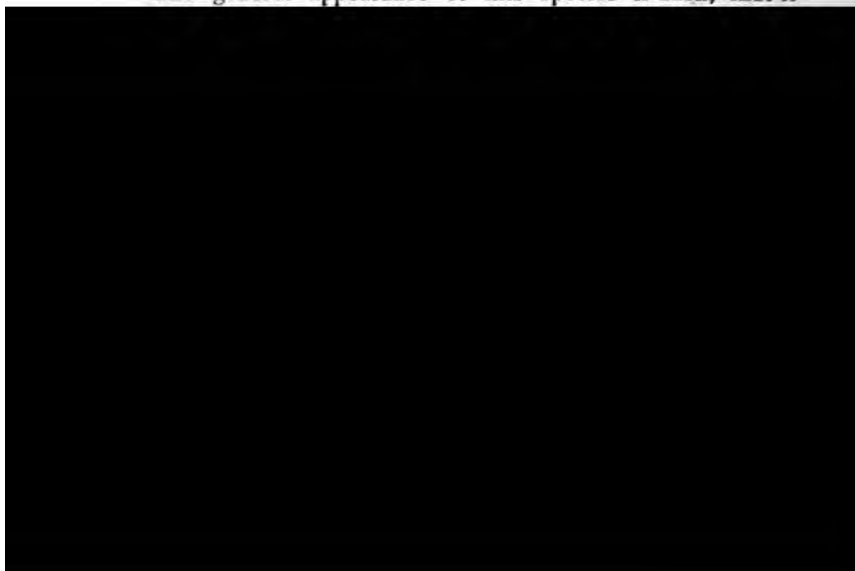
This species is found abundant in Norway; but Ellis must have been very fortunate to obtain a specimen on this coast; for after examining many scores of *Gorgoniæ* from the English channel, I have not seen a single specimen; and Mr. Peach, of Goran, informs me that he has never seen a specimen, so that on the south coast at least it is very rare.

SEA FERN, OR SEA FAN. *G. Verrucosa*. "Much and irregularly branched, branches spreading laterally, cylindrical, flexuous, barked when dry with a white warted crust; segments of the cells unequal, obtuse." *Cole*. Pl. 12, fig. 1.

*Keratophyton flabelliforme, cortice verrucosa obductum*, Raii, *Synop. Stirp.*, vol. 1, p. 32, no. 1. Warted Sea Fan, *Borlase's Nat. Hist. of Cornwall*, p. 238, pl. 24, fig. 1. *Gorgonia verrucosa*, *Ellis and Solander's Zooph.*, p. 89. *Turton's Lin.*, vol. 4, p. 648. *Stewart's Elem.*, vol. 2, p. 430. *Fleming's Brit. An.*, p. 512. *Johnston's Brit. Zooph.*, p. 182, pl. xxv., fig. 1.

*Hab.* Abundant along the whole of the south coast; Pednankern-rock, Mount's bay. *Borlase*. "In *Insula St. Georgii* prope *West-low comitatus Cornub.*" *Raii, Synop.* Every where common.

The general appearance of this species is such, that it



warts which are so thickly distributed over the crust, are the situations of the polype cells, in which the polypes lie concealed beneath the surface. The depressions, which are star-shaped, have always eight rays; but a portion of the circumference of each star, is frequently encroached on for about a fifth of its extent, by a large fleshy lip; this is the case as frequently in one variety as the other.

The varieties may be considered the two above referred to; but there are specimens of such a mixed character that they may be referred to either one or the other with equal propriety. The *G. Viminalis* is stouter than the other, more robust, less branched and more fan-shaped, and grows in deep water from six to ten leagues from the shore. The *G. Verrucosa* is more slender, more and irregularly branched, spreading laterally from the fan like plane, and grows nearer the shore and off the head lands. From these circumstances, it appears probable that the variations depend on the localities in which they grow. Those near the shore, being disturbed by a variety of currents become bushy, while those from deep water distant from the shore, being subject to the two currents of ebb and flow, acting in parallel lines, assume the fan-shape.

The branches are frequently infested with various coralines, the *Plumulariæ*, *Sertulariæ*, *Alcyonium*, &c.; *Lepades*, especially the *L. Scalpellum*; and are liable to globular excrescences, which are found to be composed of, the fleshy crust, and the horny membrane which invests the axis, which is raised and in connection with the crust, leaving the axis bare, forming a cavity which is frequently partially filled with a whitish medullary matter; this has been mentioned before in the introductory observations to this order, to which the reader is referred for further information.

This species is among the commonest on our coast; from Plymouth Sound to the Land's end and the Irish sea, it is to be found at almost all depths.

**VENUS' FAN.** *G. Flabellum*. This species grows in the form of a fan of net work, with its branches compressed; the flesh is yellow, sometimes purple or brown, with small mouths placed irregularly, having polypes with eight tentacles; the bone is black, horny and slightly striated on the large branches.

*Flabellum Veneris*, Ellis' Coral, p. 61, pl. 26, fig. A. Borlase's Nat. Hist. Corn., p. 238. Turton's Lin., vol. 4, p. 651. Fleming's Brit. An., p. 511. Johnston's Brit. Zooph., p. 185, vignette no. 19, p. 161.

The only authority for making this Cornish is Dr. Borlase, who at page 238 of his Natural History says, "It was



pressed up in Johnson's box after a storm." Most probably it was the egg, the I have not heard of another specimen having been taken, and this was found when found. It has been found near Linn by the late Mr. Murray, and Mr. Neil, according to Dr. Fleming who saw the specimen, and says it has the appearance of being fresh and recent.

### ALCYONIDE.

Polype-mass fixed, coriaceous to somewhat carnosous without any distinct rim, but strengthened by variously disposed calcareous or mucous spotting; polype cells sub-cylindrical, scattered over the surface like stars.

#### ALCYONIDÆ. Linnæus.

*Generic Character:* Polype-mass fixed, or encrusting, spongy, the skin coriaceous, marked with star-shaped pores; Interior gelatinous, dense with cellular fibres and perforated with longitudinal canals terminating in the polype cells, which are sub-cylindrical and scattered: Polypes exsertile.

**TEATS, OR DEADMAN'S HAND.** *Alcyonium Digitatum.* Polype-mass lobed or encrusting, of a fleshy spongy nature, flesh coloured, wrinkled, marked with star-shaped pores even with the surface. Pl. 13. fig. 1.

*Alcyonium ramoso-digitatum* molle, astericis undiqueque ornatum. Raii, Synop., vol. 1. p. 31, no. 1. Deadman's Hand, or Deadman's Toes, Ellis' Coral., p. 83, no. 2, pl. 32, fig. a A. *Alcyonium Manus Marine*, Blumenbach. by Gore. *Lobularia digitata*, Fleming's Brit. An., p. 515. *Alcyonium digitatum*, Ellis and Solander's Zooph., p. 175, pl. 1, fig. 7, of the polype. Turton's Lin., vol. 4, p. 652. Templeton in Mag. Nat. Hist., vol. 9, p. 470. Harvey in Mag. Nat. Hist., vol. 1, p. 55. (See also p. 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.

in thickness, and marked with stellate depressions, beneath which the polypes lie hid; in this state it is called *Sea Scruff*. In a more advanced state, the crust gets thicker and rises into nipple-like processes, in which state the fishermen call them *Teats*, and in the north of England *Cows' paps*, each of which is characteristic of its form. As it still further advances in growth, it becomes an irregular lobulated spongy mass, and in this state acquires the not very elegant name of *Deadman's toes* or *Deadman's hands*.

Externally it is of an orange colour, and is marked with stellate depressions of eight rays, answering to the number of the tentacula of the polype. The skin is tough and coriaceous, with minute calcareous points. In a longitudinal section, the substance is found to be composed of tubes which proceed from the base of the cells through the mass and variously anastomose with each other; so that an interchange of communication is kept up between each polype and the whole mass. From this frequent interchange of communication, the whole mass has a hard spongy texture. The spaces between the inosculating tubes, are filled up with a fine tubular net work; in which is diffused a semi-transparent gelatinous substance; having imbedded in it serrated irregular spicula. The tubes are composed of two, if not three layers of tissues; a cartilaginous, muscular, and membranous tunic, each of which also assists in forming the base and sides of the cells.

The polypes are semitransparent and conoidal; the apex is truncated, the centre of the surface is occupied by the mouth, and the circumference surrounded by eight fringed tentacula. The mouth opens into a membranous stomach which is freely suspended in the transparent tube forming the body of the polype. The space between the stomach and the external wall of the animal, is divided into longitudinal compartments by eight thin membranous septa, which unite the stomach and external parietes together, and keep the stomach *in situ*. At the base of the stomach is an orifice, which from being larger at one time than another, is probably of a muscular nature; around this orifice are suspended eight opaque filamentous threads which hang loosely in the cavity below. These threads, are probably subservient to the function of digestion, and partake of the character of a liver. The cavity in which these filaments are suspended, which may be considered as the abdomen of the animal, communicates with the tubes which traverse the polype mass. The *ova*, which are numerous, are formed in the sides of the tubes, and escape through the opening at the base of the stomach, into that cavity, and from thence, through the mouth into the

surrounding water; this subject is considered more fully in the introductory notes to the order.\*

The figure of *Alcyonium Lobatum* of Lamouroux apparently belongs to this species; but it is so faintly executed, that it is uncertain whether it belongs to this or another; I believe it belongs to this, though not very characteristic; a character which may be applied to many other of his figures. The figure of the *Cydonium Mulleri* in Jones' "Outlines of the Animal Kingdom," p. 27, fig. 5, also probably belongs to this, though I quoted it in the paper in the Polytechnic Report as the true *Cydonium*. Johnston's figure is good and characteristic of the expanded state. The tentacula of the polypes are liable to such a variety of appearances, depending on their partial or complete expansion, that we ought not to decide on specific differences hastily on such grounds. The differences between the different polypes figured by Ellis are great, and they differ from those of Lamouroux which correspond to the polypes of this species, and from Johnston's which most closely resemble those that I have observed.

**ALCYONIUM SANGUINEUM.** Encrusting, fleshy, and deeply lobulated; lobules elongated cylindrical, and extending nearly as low as the base; of a deep blood red colour. Polype-cells depressed, yellow, small, with eight rays, numerous. Skin coriaceous. Pl. 13, fig. 2.

Of this species I have procured only a single specimen and that, not far from land; in general appearance it resembles the last species the *Alcyonium digitatum*, but differs from it in several important particulars. Its surface is rather rough, coriaceous, and occupied by numerous spicula. The star-shaped depressions, which are numerous, are slightly depressed, yellow and marked with eight rays. The cells,

rally, not very numerous, do not divide low down, but arise from the sides and edges of the larger lobes: are always stout, somewhat compressed, and more closely resembling the teat of a cow than the human finger. In the present case, the lobes are very numerous, and divide nearly as low down as the base; they are elongated, cylindrical, and very nearly resemble the little finger, both in shape and size. As the specimen was very nearly dead when I first saw it, the polypes can of course be but very imperfectly described. They seemed very similar in shape to those of the *Al. digitatum*, but were smaller and semi-opaque; the tentacula were eight, fringed, and of a pinkish tinge, with a red band beneath, encircling them: the various orifices could not be observed. The spicula are numerous and irregularly arranged; they are linear-elongate, pointed at both extremities, with uneven, or granular spaces between; sometimes they are simple and at others united into K-shaped bodies, and occasionally wanting one or other of its members forming an imperfect K.

That this is not a variety of the *Alcyonium digitatum*, seems almost certain. Having had opportunities of examining that species in many thousand instances, from all parts of the Cornish coast, from near the shore to mid channel, and in all stages of growth, I may therefore be supposed to be familiar with it, yet on my own mind there is no doubt of its being distinct; and such also is the opinion of others who have examined it.

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### ORDER III.

#### *HELIANTHOIDA.*

This order contains the largest and most brilliant species to be found on our coast, and is therefore the most likely to attract the attention of casual observers. All naturalists who have written on them, describe them in such glowing terms as seem more fitted for the vegetable than the animal kingdom; yet when many of them are examined, such descriptions may be said, rather to have fallen short of, than to have exaggerated their beauties. Their interest to the naturalist, however, is founded on other and more important grounds; in them he recognizes the British representatives of most of those wonder working animals of the South Seas, by which the coral reefs and islands of that region are reared, and by which perhaps, continents may eventually be formed. It is true our shores cannot boast of such magnificent specimens as are brought to this country by our navigators and merchants, and that the only calcareous species we have is a

small and insignificant one ; yet the researches of the Geologist have proved, that in the early ages of our globe, species, if not identical with those of the South Seas, yet equal to them in size and beauty, once inhabited our shores. In the limestone rock of Devon, and in some of the slate rocks of our southern coast they are common and well marked.

The Cornish species are not numerous, are mostly soft, fleshy, and single animals; there being but one calcareous, and one compound species.

The most common and most numerous genus is the *Actinia* of which a representative may be found in the common brown Anemone, every where to be found between tide marks, in pools, and on the shelving sides of rocks. The character of the order is: *Polypes compound or single, free or attached, flosculous ; the body regular with a circular periphery, contractile, internally divided into numerous spaces by perpendicular muscular septa ; mouth superior and central, encircled with one or more series of tubular tentacula : stomach membranous: anus O: ovaries and cæca placed in the septa between the stomach and skin.*

The first genus we shall notice is the *Actinia*, which, in its contracted or quiescent state is hemispherical or sub-conoidal, with a central superior orifice or depression; the surface of its body is smooth and shining, or glandular and warty. In the expanded state, the apex of the cone becomes unfolded into a flat disc, having an oral aperture in the centre, a plain surface beyond it surrounded by several circles of tubular tapering tentacula, beyond which is a free plain rim. It is this free edge which infolds over the tentacula and hides them from view in the contracted state. This complete retraction of the tentacula constitutes the difference between the *Actinia* and *Anthea*, two genera, which are alike in all


their whole length. By these bands, it is, that the stomach is prevented from being entirely excluded, when the animal evolves it into the inflated membranous lobes, which it often does in a state of hunger, and when the water is impure. The stomach is a shut sac, and has only one orifice both for the receiving of its food and ejecting the faecal remains. Its inferior portion is however punctured with minute orifices and sometimes there is an orifice at its base larger than these, which seems analogous to the orifice in the asteroid polypes; though on some occasions I have failed to make it out, yet from the sphincter character it must have, it is probably closed, and hence not always apparent. It appears to be through this opening that the young are excluded and the white threads so often ejected with the stomach. The space between the stomach and sides of the animal is divided into numerous compartments by unequal longitudinal septa. They are of a muscular texture and unequal both in length and breadth; some reach from the sides of the animal to the stomach, others only reach portions of the way; some proceed from the base to the roof or oral surface, while others reach hardly so far, hence Dr. Johnston says they radiate like the gills of a mushroom to its stalk, which will convey a good idea of the arrangement. These lamellæ being muscular, greatly assist the animal in its various actions, and are the cause of the great variety of contortions which it sometimes assumes. These interseptal spaces are occupied by the ovaries and long white filaments which by some have been considered oviducts.\*

The ova are exceedingly numerous, and are enclosed in a transparent membrane which at one edge hangs free, and being double encloses the ova, and afterwards the two layers come into contact and become attached to the edges of the septa and form a mesentery which retains them *in situ*. Afterwards the two layers again separate, pass on each side of the septa and line them and the whole cavity, including the surface of the stomach and the tubes of tentacula; forming in fact a peritoneum, and performing its functions. The ovaries are attached to the whole length of the septa, and lie in horizontal folds; sometimes they are attached to each partition, and sometimes one or more are missed, and occasionally two ovaries are found on one, so that a great variety occasionally occurs. From the ovaries, according to Spix, oviducts proceed to the base of the stomach; according to Blainville, to the labial rim; and according to Delle Chiage, to the tentacula, for the expulsion of the ova. These organs

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\* Sharpey, Cyc. Anat. and Phys., p. 614.

I have never seen, unless they are the white threads, which Sharpey and Jones also describe as oviducts, but which appear to have no connection with such a function. The white filaments are convoluted, of equal thickness, small, smooth, and fibrous; if hollow, the cavity must be exceedingly small, for I have never been able to detect it. They are clothed with the peritoneum and consequently are fastened or held by a mesentery similar to the ovaries. Their functions are unknown. They are frequently ejected through the stomach and frequently are forced through the sides of the animal, as may be witnessed in the *A. dianthus*. The tentacula are tubular and tapering towards the extremity; and the tube is terminated by an orifice, which appears to be guarded by a circular muscle to prevent the ejection of the water when pressed on by the motion of the animal. The whole length of the tentacula is however pervaded by circular fibres, and hence the reason they are sometimes observed to contract more in one part than another. The orifices of these organs open into the cavity which contains the convoluted ovaries, and hence the water which distends the polype, passes readily from one part of the animal to another. In the *Anthea cereus*, these organs are very liable to malformations both of deficiency and excess. They appear to be very liable to disease, but whether from disease or accident, if any part be injured it is soon thrown off and the tentacula appear truncated. Sometimes a great many are thus injured, but most commonly only one here and there. Scarcely a specimen, however, can be found, but is more or less thus injured. Young ones are constantly sprouting up from between the old ones, and are always to be found from the size of a mere tubercle to the perfect organ. Some tentacula are branched in a dichotomous manner, but





The studded Sea flower in its most perfect state has its mouth surrounded with several rows of unequal tentacula, which are marked with bars of carnation, lake, brown, and white, in such a manner that each forms a succession of circles round the mouth, and present a scene of such remarkable brilliancy and beauty, as few flowers can equal. The Sea daisy is not so brilliant as the one just mentioned. It has however its patches of brown, yellow and flesh colour so beautifully and harmoniously blended, its festooned circumference so surrounded by a circle of short variegated tentacula, forming a fringe of such "inimitable beauty" as fairly to entitle it to the epithet "*Actiniarum pulcherima*," given it by Müller. They are not admired, simply because they are so far removed from common observation, as to be but rarely seen. Their great beauty, the certainty with which they are said to foretell a change of weather by the opening or closing their tentacula, and their great tenacity of life, by which they may be kept in confinement for years with an occasional change of water, would point them out as a pretty, agreeable and useful variety to the ornaments for the boudoir. With but one exception, all of the *Actiniidæ* are single or formed of only one polype, and locomotive. But the different species vary a great deal in activity; the most active perhaps is the *Anthea cereus*, which is the most delicate and shortest lived of all. The studded sea flowers and sea daisies, in a state of nature rarely move from the spot in which they have once fixed themselves. Some of the former I have known to retain their situations for five years; but when in confinement, they very freely move to all parts of the vessel. When quiescent they very firmly adhere by their bases to the stones on which they rest. This adhesion is commonly said to be effected by means of a glutinous secretion from the base; but never having found a secretion of sufficient tenacity to account for the firmness of their hold, the explanation must be sought for in some other way. It is however readily found in the muscular foot disc, which in contracting elevates the centre and a vacuum is formed, the circumference being closely in contact with the rock or stone. A common and familiar illustration may be found of the way in which it is done, in the school boy's leathern sucker. This is also the way in which it is effected in the *Lucernariæ*, and most probably in all the others. If the edge of the foot be raised with the nail, the whole is easily detached; if fresh water be poured on them they immediately die and then the adhesion is very little; in the last place the animal can loose its hold at pleasure and move from place to place with a gentle gliding motion, but the moment it is attempted to be removed it regains its former firm hold.



Another mode of progression is by means of their tentacula. This is perhaps the most rapid of all, but I have never seen any of the animals voluntarily make use of it, except the *Lucernariæ*; I have placed them on the oral disc and they have travelled with ease and comparative rapidity by using the tentacula, especially the *Anthea*, which is capable of more variety of action than any of the others. They are said also to distend their bodies with water and allow themselves to be washed about by the random motions of the sea; this I have never seen.

This class of animals, so entirely destitute of solid parts whereby they might perform their various muscular actions, forcibly points out the resources of nature in overcoming difficulties apparently insurmountable. Being so universally soft and gelatinous, no point is offered as a fulcrum on which the muscles can act; but yet a great variety of definite actions are performed with readiness, and are entirely under the guidance of the animal. When they are about to exert themselves, they imbibe water and distend themselves to any extent they please. In this distended state the orifices of the tentacula and all other means of exit are closed, and thus, when the muscles act, they exert themselves on the contained water, which, by resisting, becomes converted into a fulcrum as efficacious as it is simple. This mode of compensating for the want of solid points for muscular action is greatly diffused through the animal kingdom; instances of its exclusive use are to be found in the *Physalia*, or Portuguese man of war, where however, *air* is used instead of water; in the feet of the *Asteriadae*, and in fact in all the *Echinodermata*, and in a rudimentary state, in an organ of the highest animals and in man. But this which is so rudimentary and nearly disappears in the higher animals, is the sole means of exer-

the interior portion of the stomach and the mouth was of course prevented, yet instead of emaciating and dying of a hydropy, the animal had availed itself of what undoubtedly had been a very untoward accident, to increase its enjoyments and its chances of double fare. A new mouth, furnished with two rows of numerous tentacula was opened on what had been the base, and led to the under stomach: the individual had indeed become a sort of Siamese twin, but with greater intimacy and extent in its union.' This case also illustrates the power these creatures have of sustaining injuries of the most formidable kind, with apparent impunity, and which is exceeded only by the Hydra. They have been divided longitudinally and transversely, and the separated portions have either again united or become developed into separate animals. On two occasions I have met with results similar to those described by the Abbé Dicquemare, having divided transversely several specimens of the common Anemone (*A. Mesembryanthemum*) in such a manner that any thing taken in at the mouth passes out at the truncated surface below; but the cut surface closed in a few days so as to retain the food and in six weeks a new mouth and tentacula were formed, presenting the curious spectacle of an animal taking food at both extremities. If in taking the animal from its situation it be very much mutilated, it soon regains its former state, and if a portion be separated, it will frequently be developed into another polype. It has been said that if the base be torn the animal dies; an observation I am unable to confirm and have good reason to doubt. If any portion of an actinia be injured or destroyed, the animal possesses a power of replacing it. This power of reproducing lost parts, however, is not confined to Zoophytes, but is found in the re-formation of the rays of star fishes, of the claws of crabs, and extends even to the vertebratæ as is seen in the *Batrachian* reptiles.

The manner in which the water is taken in and expelled in the Actiniæ is not yet settled. Professor Jones says it is taken in through the tentacula, while Professor Sharpey says he has repeatedly noticed the water entering by the mouth, and I have on many occasions seen the same thing; perhaps some also enters by the small openings distributed over the surface, and through which the white threads are sometimes expelled. It sometimes escapes by the mouth and frequently through the tentacula; if the animal be pressed, it will be found to escape only through a few of the tentacula, but if the animal be allowed to eject it itself, nearly all are pervious; from which it would appear that great foreign pressure prevents a relaxation of the muscles guarding the orifices.

As we have had occasion to mention the great resources of nature in effecting her objects, so we may now notice the wonderful economy she observes in making those resources subservient to different purposes. The water not only serves as a fulcrum for muscular action, but for the purposes of respiration and the perfection of the ova; and to each of these functions it is equally indispensable. The function of primary importance in all animals appears to be the respiratory; if this be deranged in these creatures we soon see the strange condition into which they are thrown, and the contrast it forms with the healthy state, in which every function beautifully depends on the others. If an *Actinia* be placed in deteriorated water, it endeavours to make up in the quantity what it loses in the quality of the water. It imbibes so much as to distend the body to an enormous extent; so much as to make it resemble an inflated bladder, rather than the animal it is. The pressure of the water behind forces the stomach out of the mouth, which together with the white threads, hangs in transparent lobes over the sides of the animal. As the respiration appears to be carried on chiefly by vibratory cilia, and these filaments and the stomach are clothed with them, their exposure greatly assists the process by enlarging the surface and exposing it to more water. The ova also suffer a considerable check in their development, hence many that have been kept in unfavourable positions on the shores have never increased, and having become transparent, it could be seen that the ova were very imperfectly developed in any and in some not at all; and there they are and have been for two years and half, the same in number, though different in appearance. Those always thrive best that are most exposed to the violence of the sea. When thus distended their muscular energy is

tentacula, where they are frequently found, or into the stomach. On many occasions, when forcibly pressing the *A. Mesembryanthemum*, several of the young have been forced through the tentacula. The ova which are yellowish, are clothed with cilia, and become frequently developed into the polype internally. It would be out of place here, and tend to increase the size of this work too much, to enter into this and several other particulars more minutely. As they would be of interest only to the Anatomist and Physiologist they are passed lightly over. The first and most common mode of reproduction is by ova, the second by budding, as is observed only in the *Zoanthus*. In this genus the trailing fleshy band which connects the different polypes becomes enlarged at intervals into papillary eminences, and afterwards becomes developed into polypes.

Another mode of reproduction sometimes takes place by division. Having kept some specimens of *A. dianthus* in confinement, it was found that they would occasionally divide at the base, and the division would proceed upwards to the oral disc. In this state they look just like what the Abbè Dicquemare describes as the union of two individuals from contact. Possibly such an union may take place, as they are so gregarious as to be actually in contact, and double mostrosities occur at birth; but I have not seen it.

The *Zoanthus Couchii* is the only compound species of our shores. It may be characterized as a number of small actiniae united at their bases by a trailing fleshy band. It is a very limited genus and till the discovery of a species on our shores a short time since, had no representative in Europe.

The next genus *Lucernaria* is a remarkably pretty one, and from its activity and transparency, a very interesting one. In form, it very closely resembles the old fashioned conoidal wine glasses; having a round disc-like base, a round columnar stalk, which terminates superiorly in a free campanulate expansion; around the margin of which are eight separate tufts of tentacula. I never could find that Lamouroux' assertion, that they perceived their prey at a distance and pursued it, was correct, though I have watched many scores in their natural situations for that purpose. They only seem conscious of the presence of food when it impinges on the tentacula. The ova are developed about April, May, and June, either in loops from tuft to tuft, or in lines from the tentacula to the base, and are frequently there united in pairs. They are subject to a great many variations of colour but are generally brownish, brownish-green or brownish-red. Their food consists chiefly of small crustaceans.

The only calcareous species we have, is the comparatively insignificant one, the *Caryophyllia Smithii*. It is common at

all depths to a little beyond low-water mark. The animal, when expanded, resembles in form the naked Actiniæ; when contracted it retires from sight into the calcareous cup. It is to be found of all sizes from a mere speck to an inch in height. In a very young state it is sometimes found parasitical on the *Alcyonium digitatum*, on shells, and the stalks of sea weed; but as these substances are very perishable in their nature, and offer no solid foundation on which to stand, large specimens are never found on them; on rocks and stones, however, they are frequently large and in great profusion. In the youngest state the animal is naked, and measures about the fifteenth of an inch in diameter and about the thirty-second of an inch in height. In the earliest state in which I have seen the calcareous polypidom, there were four small rays, which were free or unconnected down to the base; in others I have noticed six primary rays, but in every case they were unconnected with each other. Other rays soon make their appearance between those first formed; They are mere calcareous specks at first but afterwards increase in size. The first union of the rays is observed as a small calcareous rim at the base of the polype, which afterwards increases both in height and diameter with the age of the animal.

In taking a review of the polypes of this order, we find that though there is a considerable resemblance in their general anatomy to that of the Asteroid polypes; yet there is also a considerable advance in the complication and elaboration of their various parts. In both there is the radiate form of tentacula, the central membranous stomach, the intervening space between the stomach and sides of the polypes, the dividing the space by longitudinal septa, and one opening serving both for the reception of food and ejection

which we may conclude that a continual absorption and deposition goes on in this apparently inorganic mass. That a vital action does take place in this calcareous base is confirmed by the collateral evidence of what takes place in the larger species of other climates. Mr. Stutchbury in his valuable paper on the growth of young corals of the genus *Fungia*, proves that the young are thrown off from the parents, and that the cicatrices are afterwards filled up with a fresh deposit of calcareous matter.\* De la Beche also, in his Manual of Geology† quotes Mr. Lloyd as detaching some "polypifers" from their place of growth on the Isthmus of Panama, leaving them behind in pools for a day or two, and as finding them afterwards fixed to the spot by a fresh secretion of calcareous matter. These and other observations scattered through numerous papers in the transactions of learned societies, scarcely leave a doubt on the subject.

Though these beings are of so low a grade in the scale of life; yet they have exercised in ages past, and still continue to exert a great influence in the history and economy of the earth's surface. Though so insignificant and apparently, even contemptible in themselves; yet by their combined energy and imperishable masonry they have raised

A new creation in the secret deep.  
Omnipotence wrought in them, with them, by them;  
Hence what Omnipotence alone could do  
Worms did:

and islands of importance and great beauty are every where scattered through the South Seas; coral reefs are still forming, and extending even to the waters edge, waiting for some upheaving to convert the Ocean into dry land. The Geologist tells us that in the earliest ages they had a more extended range than at the present time. He considers them as indices to the revolutions which the earth has undergone since the Creation. Whether these speculations be true or false, yet we must all confess that these worms have always held a situation of vast Geological importance:—a situation, the more we contemplate, the more miraculous it seems.

#### MADREPHYLLÆA.

Body cased with a solid calcareous cupped polypidom, lamellated internally.

#### CARYOPHYLLIA. Lamarck.

*Generic Character:* Animal like the Actinia; polypidom permanently fixed, simple, cylindrical or conoid, striated externally in a longitudinal direction, the top hollowed into a lamellated stellular cap.

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\* Lin. Trans., vol. 16.

† Geol. Manual, p. 151, 1832.

**C. SMITHII.** Polypidom cylindrical, lamellæ entire, arched, finely crenate, from three to five smaller ones between the larger, centre tubercular. Pl. 12, fig. 3.

*Madrepora cyathus*, Ellis and Solander's Zooph., p. 150, tab. 28, fig. 7. *Caryophyllia cyathus*, Fleming's Brit. An., p. 508. *Caryophyllia sessilis*, Bellamy's South Devon Nat. Hist., p. 330, tab. 18. *C. Smithii*, Harvey in Mag. Nat. Hist., vol. 1, new series, p. 474, fig. 55, (the figure of the animal inaccurate.) Johnston's Brit. Zooph., p. 207, fig. 30, p. 206.

**Hab.** On stones from deep water, abundant. Polperro, Goran, Mevagissey, Veryan.

There is scarcely a stone drawn from deep water, but has several specimens of this species attached to it, and in many cases so many as sixty, or even more.

The height of this Zoophyte varies from one-eighth of an inch to an inch; it is calcareous, cylindrical or conical, longitudinally striated externally, and firmly united to the rock. Superiorly it is cupped or concave, and lamellated. The lamellæ may be divided into three kinds; first, the primary or larger ones, which rise above the rest and extend from the circumference two-thirds towards the centre, and vary in number from twelve to twenty, and Dr. Fleming says to forty; this number does not depend on the size of the specimen. Between these primary ones are three smaller ones, the centre one of which is the largest, and extends from the circumference halfway towards the centre, where it apparently ends, but soon after rises into another gill, forming an inner series, lying between the primary ones and the tuberculated centre. The external longitudinal striæ, are formed by the attachments of the gills inside.



The shape of this species is subject to variation, being either conical or cylindrical. The cylindrical, the *C. Sessilis* of Bellamy, is low and may be said to be blended with the rock on which it stands: while the conical ones, which have a foot-stalk, when arrived at a certain size, may frequently be removed by the fingers. This I considered to be the *Turbinolia Borealis* of Dr. Fleming, which is described as being "widely conical and slightly bent," and said to become detached by age, but Dr. Johnston tells me it is the *C. Smithii* of his work.

ZOANTHUS. Cuvier.

*Generic Character*: Polype mass compound; polypes distant, united at their bases by a trailing fleshy band, or broad fleshy base. Animal an Actinia.

**ZOANTHUS COUCHII.** *Johnston.* Polype-mass compound; polypes distant, when contracted hemispherical, when expanded, pedunculated, united at their bases by an encrusting fleshy band; tentacula in several circles. Pl. xv., fig. 2.

*Hab.* On flat slates and rocks in deep water from one to ten leagues from the shore, throughout the Cornish part of the British Channel. Common.

This, in being compound, differs from all other European species of the order, and approaches very closely in form to the *Actinia sociata* of Ellis. It is a very small species, and composed of a number of Actiniæ united together at their bases by a thin, encrusting fleshy band. It is of a light sandy or opaque red colour, and its surface is minutely glandular. In its contracted state it is sub-conoidal; resembling both in shape and size a split pea. When living, except that it is glandular, its surface is plain, but when preserved it becomes corrugated. When semi-expanded, which is its favourite state, it elevates itself to about twice its former height and becomes contracted about its middle into an hour glass form. The upper portion is lighter than the lower, and the superior or oral surface is marked by a central depression or mouth, and from it radiate to the circumference, numerous rows of whitish glandular looking bodies, which are the tentacula in a contracted state. When the creature is fully expanded, the tentacula become distended and elongated to about the length of the transverse diameter of the body; and they are generally darker at their extremities than towards the base. Like all the Actiniæ, the present species possesses a power of considerably altering its shape; most frequently it is in the shape of an hour glass, at others the oral surface is contracted to a mere point, and then occasionally, is again enlarged to nearly twice the size of any other part; sometimes the mouth is depressed, and at others is elevated into an



obtuse cone. This species in addition to being rooted is one of the most inactive of its order; for whether in a state of contraction or expansion it will remain so for many days or even a week without apparent change. If it should be in an expanded state, a touch will make it contract, and it will, most commonly remain so for several days. Its most favourite state, is the semi-expanded in which it will sometimes remain from a week to a fortnight without change.

The trailing connecting band is flat, thin, narrow and of the same texture as the polype and glandular. It frequently gets enlarged into small papillary eminences, which as they become enlarged, become developed into polypes.

This species and the *Actinia sociata* of Ellis are very closely allied to each other; this, however, is shorter, smaller and not so much pedunculated as Ellis figures his to be, and the fleshy band also appears to be thinner and wider.

Having communicated specimens to Dr. G. Johnston, he is of opinion that it is distinct from Ellis' species, and has done me the honour to give it the name quoted above.

#### ACTINIIDÆ.

Body naked, fleshy, contractile, locomotive.

ACTINIA, Linnæus.

*Generic Character:* Body conoid or cylindrical, adhering by a broad base: the space between the mouth and the rim of the upper disc, occupied by one or more series of conical undivided tubular tentacula, which are entirely retractile.

SEA-FIG MARYGOLD; SEA-ANEMONE; COWS.

*A. Mesembryanthemum.* Body conical, smooth; tentacula in several rows; around the oral disc a row of azure blue tubercles. Pl. iv., fig. 1.

shelving sides of rocks between tide marks, where it is frequently left dry by the ebbing tide. In a contracted state it is hemispherical or conoidal; in its expanded more or less columnar, with its upper extremity surrounded with several series of tentacula, and a free plaited margin which folds in and covers the tentacula when the animal is contracted. It varies in size to one inch or one inch and half in diameter at its base and to the same in height. The surface of the body is smooth, but is frequently drawn into longitudinal and circular folds at the will of the animal. The colour is liable to many variations of brown, green, red and sometimes a mixture of the whole in longitudinal stripes. The tentacula are in several series, small and with the oral disc always of a lighter colour than the rest of the body; between the outer row of tentacula and the free plaited edge of the disc is a circle of azure blue tubercles, which are most apparent when the animal is semi-expanded. Though these tubercles are described as being blue, yet I have seen many red, and in one locality they are all white, the whole animal in the same spot is very frequently of a transparent whitish pink colour, and sometimes of a pure white. This spot is rather exposed to the sea, but sheltered by a ledge of rocks, the bottom is sandy, and the place is very frequently nearly filled with decomposing sea weed. The verge of the base is always of lighter or different colour from the body and is very frequently formed by a blue band.

Gærtner was of opinion that this species changed its colour with the seasons, being red in summer and brown or green in autumn, this however appears to be without foundation; the red, brown and green varieties occur mingled together at all seasons; there is, perhaps, a little variation in the lightness of the tint during summer, but each retains its own colour throughout the year. In some situations, such as the upright face of a stone in a sandy or muddy soil, the animal becomes so flaccid and so different in form and colour, as scarcely to be recognised; but they always possess the rim of tubercles, and by this they may be known. It is a very cleanly species, and always prefers for its place of fixture the sloping surface of a rock, where it can be abundantly supplied with good water; if this cannot be procured, it suffers by the change.

**ACTINIA VIDUATA.** Body conoid, longitudinally striped with light brown or yellow and white; tentacula marked with circles of the same.

*Actinia Viduata*, Johnston in *Mag. Nat. Hist.*, vol. 8, p. 82, fig. 13; *Brit. Zooph.*, p. 211, fig. 29, p. 205.

*Hab.* From deep water on the *Pinna ingens*; and in sandy ground near low water mark. Polperro, Whitsand bay, Coomb, &c.

Dr. Johnston considers this a variety of the preceding species, but where we have a permanent difference in the appearance of an animal, connected with a difference of habit, there is I think sufficient grounds for making it a distinct species. Dr. Johnston says, "this variety attaches itself to shelving rocks, where it is concealed and covered over by a layer of sand, protruding the tentacula through a small aperture at the surface opposite the mouth; on the recess of the tide nothing of the animal can be seen, and its presence or locality is only to be guessed at by the holes in the sand." This forms a good characteristic habit, but the opposite of the last kind, which prefers a clean rock.

SEA-DAISY. *A. Bellis*. Body lengthened, the lower part narrow and smooth, the upper enlarged and glandularly warty; oral disc expanded, lobed; tentacula, in several rows, variegated.

*Actinia Bellis*, Ellis and Solander's Zooph., p. 2, no. 2. Turton's Lin., vol. 4, p. 103. *Hydra Bellis*, Stewart's Elem., vol. 2, p. 451. *Actinia Pedunculata*, Pennant's Brit. Zoology, vol. 4, p. 49. Fleming's Brit. An., p. 498. Templeton in Mag. Nat. Hist., vol. 9, p. 303. *A. Bellis*, Johnston's Brit. Zooph., p. 212.

*Hab.* In sheltered situations and covered pools, under Chapel Hill, Polperro, Talland sand bay, Lantivet bay, and Whitsand bay; pools about Mount's bay, in companies of four or five.

The base of this species is narrow and smooth, above it is expanded and tubercular or warted, to which, fragments of shells and stones adhere, so as to blend the appearance of animal with the surrounding ground. When expanded, the variegated tentacula, which are arranged in several rows and

pl. 27. *Actinia verrucosa*, Pennant's Brit. Zool., vol. 4, p. 49. *A. monile*, (young) Templeton in Mag. Nat. Hist., vol. 9, p. 303. *Hydra gemmacea*, Stewart's Elem., vol. 2, p. 451. *A. senilis*, Flem. Brit. An., p. 498.

There are four varieties of this species, which it will be necessary to notice :

First. Body warty; the warts large in vertical rows. *Hydra gemmacea*, Stew. Elem., vol. 2, p. 451. *Actinia gemmacea*, Ellis and Solander's Zooph., p. 3. Turton's Lin., vol. 4, p. 104. *Actinia verrucosa*, Pennant's Brit. Zool., vol. 4, p. 49.

Second. Body warty; warts equal, distinct, and scattered irregularly. Templeton in Mag. Nat. Hist., vol. 9, p. 303.

Third. Body warty; warts small, obscure, and distant. *Actinia equina*, Pennant's Brit. Zool., vol. 4, p. —.

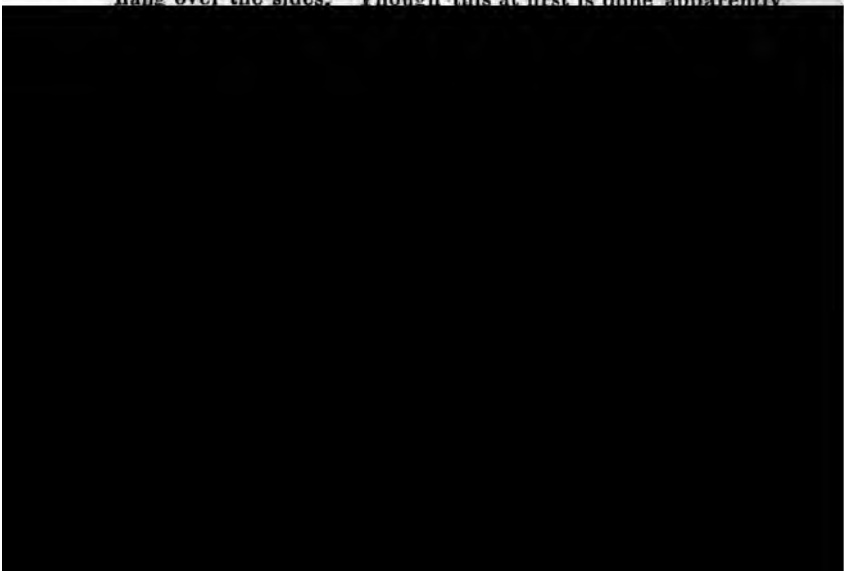
Fourth. Body smooth, clouded with scarlet; tentacula with red and white. *Actinia crassicomis*, Turton's Lin., vol. 4, p. 100. Stewart's Elem., vol. 1, p. 393. *A. truncata*, Turton's Lin., vol. 4, p. 101.

*Hab.* In pools on stones, near low water mark; West Combe, Lansallos, Chapel Hill, Whitsand bay, Goran, &c. From deep water, on shells and stones. Common; and is very commonly left dry by the receding tide; these are very tubercular and covered with fragments of stones.

This is amongst the largest and most gaudy of the British *Actiniidæ*, and from the great difference in the nature of the localities in which it is found, it is liable to a great many variations in colour and appearance. It is most commonly about two inches, or two inches and half in diameter, but one specimen, when fully expanded, measured six inches and half across the oral disc; this was procured from deep water, but it is most commonly smaller. It is generally of a red colour, but is not unfrequently striped with yellow, blue, and sap green; the surface is most commonly studded with tubercles, which in different individuals are differently arranged. In some the tubercles are large and arranged in longitudinal bead-like rows; these are found near the shores and in the neighbourhood of sandy soils. In others, the tubercles are smaller and without any regular distribution, and in some they may be said almost to have disappeared. These tubercles are always of a lighter colour than the surrounding parts, and have very frequently adhering to them, fragments of shells and stones, by which the animal conceals itself from view. In a contracted state it is hemispherical or conoidal, with a broad base and a low rounded apex; in an expanded state it is shortly columnar,

and its upper surface is surrounded by several rows of variegated tentacula. The mouth is central, and surrounded by a thick lip of a reddish colour. This is marked at two opposite points with a radiating line of a light colour and frequently of a rose tint terminating in white, but varying in different individuals. Beyond this lip is a narrow circle of white, more or less distinctly marked; beyond this is a darker surface, semi-transparent and surrounded by several rows of tentacula. The base of each tentaculum is embraced by two red, and the inner row also by two white lines, which converge on either side and cross the oral disc on the one hand, and pass between the bases of the tentacula on the other. Each circle of tentacula is regularly marked with bars of carnation, lake, brown, yellow, and white, in such a manner that a series of coloured circles is formed around the mouth; so that when the animal is fully expanded it presents a scene of such remarkable brilliancy and beauty as to rival even the flowers; but it is liable to so many variations in the arrangement and depth of the tints that a description will serve only for a few individuals. The resemblance to a flower is very great, and a stranger might be excused for mistaking it. On one occasion while watching a specimen that was covered merely by a rim of water, a bee, wandering near, darted through the water to the mouth of the animal, evidently mistaking the creature for a flower, and though it struggled a great deal to get free, was retained till it was drowned and was then swallowed.

When an individual of this species has been kept in confinement for some time it gets flaccid and semi-transparent, the lips become everted and several transparent striated lobes become evolved, and sometimes to such an extent as to hang over the sides. Though this at first is done apparently



**SEA-CARNATION.** *A. Dianthus.* Body cylindrical, smooth, oral disc expanded, lobed, with numerous irregular tentacula; outer row shortest and forming a fringe.

*Hydra dianthus*, Stewart's Elem., vol. 2, p. 451. *Actinia dianthus*, Ellis and Solander's Zooph., p. 7, no. 9. Turton's Lin., vol. 4, p. 104. Fleming's Brit. An., p. 498. Stewart's Elem., vol. 1, p. 394. Johnston's Brit. Zooph., p. 216, pl. xxviii. *Actinia pentapetala*, Pennant's Brit. Zool., vol. 4, p. 104, *A. plumosa*, Turton's Lin., vol. 4, p. 100. Stewart's Elem., vol. 1, p. 394.

*Hab.* Common in pools, within low water mark; Polperro, Tolland sand bay, East Coombe, Gorran, Fowey.

This common species is to be found in the crevices of rocks in pools between tide marks. It is gregarious, and the large and small, old and young indiscriminately mix together. In a contracted state it is sub-conoidal, the apex of the cone being rounded and depressed. The surface is smooth, or but faintly striated in a longitudinal manner. The most prevailing colour is a chesnut brown; but it is sometimes of a pale ash, whitish or yellow tint. When brown it bears a very great resemblance to the *A. Mesembryanthemum* in a contracted state. When expanded the body is columnar, but is liable to variations from unequal contractions of the longitudinal and circular muscular fibres. The circumference of the oral surface is generally contracted into from three to eleven festoons. The tentacula are very numerous and short; the longest are the most central, and the shortest the most external, forming a mere fringe. The upper surface being thus lobed and fringed with short tentacula generally variegated with bars of yellow, brown, light blue, green, &c., which are very beautifully blended, has a very soft and rich appearance; sometimes however the tentacula are of a pale ash colour with their bases brown. The intervening space between the mouth and tentacula is plain and smooth; and it is either of a brown colour or variegated with radiating bands of brown and cream colour. The mouth is central and oval, and the lips are generally of a bright vermilion colour, but this varies in different localities. When expanded this is a very beautiful species. The studded sea flower, certainly exceeds it in the brilliancy and contrasts of its colouring, but for beauty, richness, and softness in its tints, it is without a rival.

Though decidedly gregarious, it is not so much so as the next. It prefers the crevices of the open pool, rather than the narrow deep and hidden ones as is the habit of the next species.



**ACTINIA TEMPLETONII.** Body columnar, tubercular; disc festooned; tentacula numerous and short.

*Actinia dianthus*, Templeton in Mag. Nat. Hist., vol. 9, p. 304.

*Hab.* In narrow deep crevices between tide marks, common. Whitsand bay, Looe, Talland sand, Polperro, Lantivet, and Mevagissey bays. Fowey.

This, though not an abundant, is a common species, found in pools the whole length of our South coast. It is highly gregarious, the animals living in close contact with each other. It prefers those crevices which are narrow and deep, in pools containing fragments of stones and *Corallina officinalis*; but is not unfrequently to be found in spots of an opposite character. Into these recesses it readily withdraws from danger or alarm. When thus contracted, it is entirely out of sight, and almost out of reach. Thus situated, it is necessary to break down the surrounding rock to procure a specimen. It will occasionally leave these retreats and wander by an almost imperceptible gliding motion of the foot disc over the whole pool.

In a contracted state it is hemispherical, expanded, columnar, varying in length according to the depth of its retreat. Externally it is coriaceous and irregularly glandular; superiorly it is of a neutral tint inclining to pink; inferiorly, of a yellowish flesh colour, and most commonly smooth. The oral margin is festooned, and the surface is variegated like *A. dianthus*.

This and *A. dianthus* have hitherto been considered as forming one species; but the surface of one is coriaceous and tubercular, and of the other plain and smooth. This and their difference of habit appear to be sufficient grounds for a specific distinction. Both have been found living in the same

probably be considered a variety of the *Actinia gemmacea*, as that kind is liable to so many variations, but it had not the appearance of belonging to that species. The favourite site for them is on the claw of the Corwich crab, (*M. verrucosa*) and on the *Pinna ingens*.

ANTHEA. Johnston.

*Generic Character*: Body cylindraceous, adhering by a broad base; tentacula disposed in circles round the mouth, elongated, tapered, and incapable of being retracted within the body. Johnston.

**SEA-TORCH THISTLE.** *A. Cereus*. Body smooth, cylindrical, longitudinally furrowed, ending superiorly in a waved line; tentacula long and generally tipped with red. Pl. xiv., fig. 2.

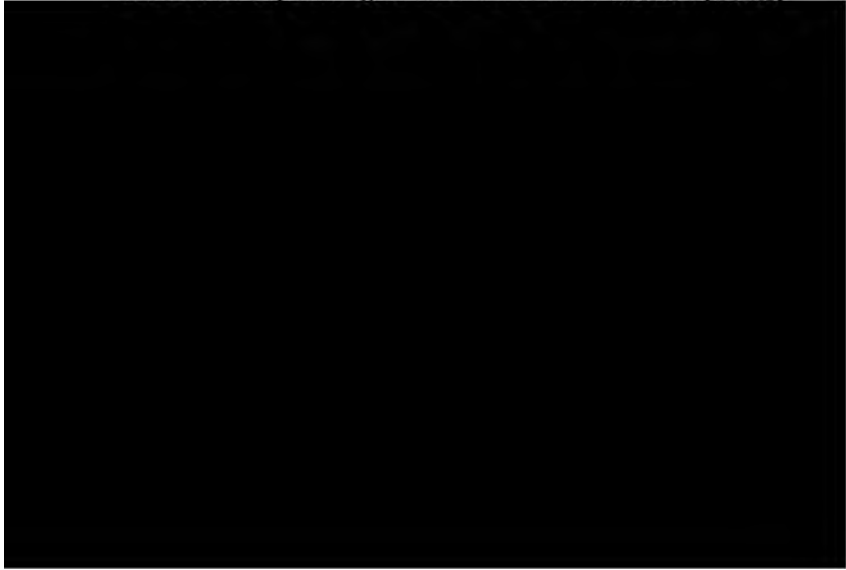
*Actinia cereus*, Ellis and Solander's Zooph., p. 2, no. 1. Turton's Lin., vol. 4, p. 103. *Actinia sulcata*, Stewart's Elem., vol. 1, p. 394. Fleming's Brit. An., p. 498. Pennant's Brit. Zool., vol. 4, p. Hydra cereus, Stewart's Elem., vol. 2, p. 451. *Anthea cereus*, Johnston's Brit. Zooph., p. 221.

*Hab.* In the crevices of the rocks; Polperro, Tolland sand, Looe, Fowey; common.

This species is very common on all that part of the south coast that has been examined, as much, if not more so than the Sea Anemone, *A. Mesembryanthemum*, but as it is gregarious and confined to pools and crevices of rocks which always remain covered with the sea, and of a light colour, it is not so readily observed as that species which lies indiscriminately scattered over the rocks between tide marks. The pools they prefer are those which have a southern aspect and which are visited by the sea at every tide. Sometimes they occur only in small companies, and at others singly, according to the nature of the spot, but I have frequently found them covering a surface of three feet in diameter. The animals are generally in close approximation with each other, and most commonly in contact. They are liable to so many changes of form that a minute description of them would be both tedious and useless. In a contracted state, they are generally columnar and of equal diameter throughout, and the tentacula diminished both in size and length; sometimes they are hemispherical, with the tentacula pressed together and protruding from a central orifice; at others the body is drawn towards the base and flat, while the oral surface is exposed or covered only by the contracted tentacula. The surface of the body is smooth, but longitudinally striated; the furrows run from the base to the margin of the oral disc, where they terminate in a waved or festooned



border or margin. Each space between the furrows, is frequently again furrowed by two or three finer ones; but these are not always apparent, especially when the animal is much distended. When the polype is fully expanded, the oral surface is frequently enlarged from half-an-inch to one inch and half, and the furrows of the sides appear as if they terminated superiorly in tubercular looking bodies. The shape varies as in the contracted state, from the columnar to the hemispherical and hourglass contracted form. The oral surface is generally of a darker brown than the other parts, and nearly always marked with one, frequently with two, and sometimes with many white radiating lines, which terminate at the base of the tentacula. The mouth is central, slightly elevated, irregular in shape, and marked with two furrows internally which run down into the stomach. The tentacula are long and stout, and vary in number with the age of the individual; Gærtner says they amount occasionally to 200, and I have counted 150; they are about twice the length of the body when fully expanded, and are incapable of being withdrawn as is the case with the Actiniæ. They are of very unequal length and size, and frequently get contracted in various parts as if diseased; this is most probably the case, since the upper portion is frequently sloughed off, and thus they become truncated. I have in four instances found the tentacula on one side entirely absent, or so short as to be little more than mere tubercles and others springing up in their places. Almost every specimen examined, shows this growth and decay of the tentacula in a greater or less degree, the smaller ones springing up between the larger and perfect ones in every degree of length. Beside this, the tentacula are liable to mal-formations, some give off one or more lateral sprouts,



tinued, though gentle action. It moves freely about from place to place by a gliding motion of its base; or by turning on its oral surface, can move far more rapidly by means of its tentacula.

#### LUCERNARIA.

*Generic Character:* Body somewhat campanulate, fixed when at rest by a narrow disc or stalk; mouth quadrangular, in the centre of a reversed umbrella-like expansion; tentacula disposed in widely separate tufts on the margin.

**L. AURICULA.** Body funnel-shaped, with eight equidistant tufts of tentacula round the margin; between each tuft a marginal tubercle. Pl. xvi., figs. 1, 2, 3.

*Lucernaria auricula*, Turton's Lin., vol. 4, p. 121. Fleming's Brit. An., p. 499. Johnston in Mag. Nat. Hist., vol. 5, p. 44; Brit. Zooph., p. 229, fig. 35, p. 230, fig. 36, p. 193, fig. 28. Templeton in Mag. Nat. Hist., vol. 9, p. 304.

*Hab.* On fuci, at Talland sand bay, Chapel pits, Polperro. Abundant about June, July, and August.

This species I have found abundant in some years, while in others, I have hardly been able to procure a single specimen. Though I have supposed it the *L. auricula* of the authors quoted above, yet it differs in some important particulars. The form of the body very much resembles the conoidal, or old form of wine glasses; the upper and free margin is surrounded by eight equidistant tufts of tentacula. From each of these tufts of suckers a thick chain of brown glandular looking bodies proceeds downwards, for about two-thirds the length of the body, where they unite in pairs, and then proceed as a very delicate thread to the base. The foot-stalk is small and tubular, resembling the stalk of a wine glass, and under certain lights appears to be annular, or to have a spiral thread running its whole length. The termination of this foot-stalk is in a flat cup-like disc, by which it adheres to the fucus on which it stands. Between each pair of tufts of tentacula is a marginal gland. The mouth is central, elevated, and somewhat quadrangular. At the four angular projections of the lip are four bodies attached externally, rounded superiorly, and pointed inferiorly.

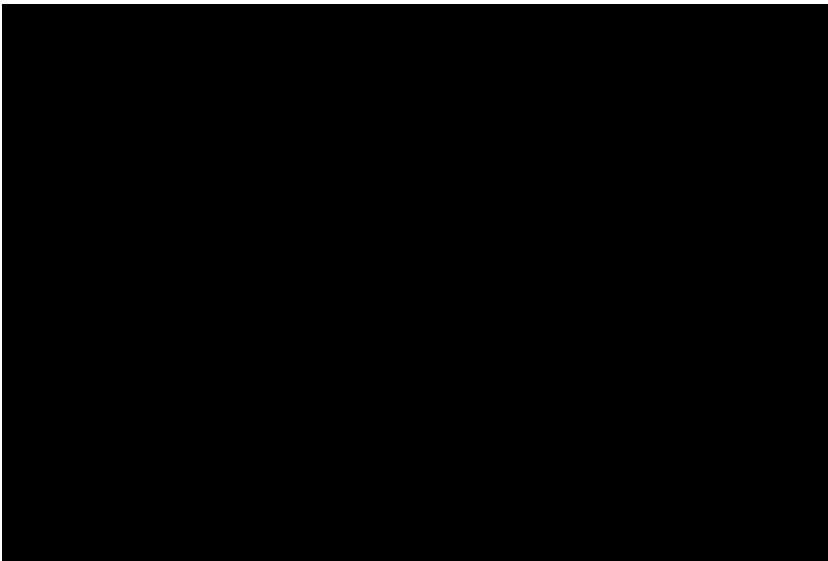
The colour is generally of a reddish brown, but is sometimes of a liver brown, green, or yellowish. They fix themselves to the fuci by their sucker-like discs, in nearly an erect position; never, however, hanging down or standing perfectly erect.

Their mode of progression differs under different circumstances. If intending to move to any great distance, they do so by loosening their attachments, and then by various and active contortions, waft themselves away till they meet with

an obstruction; there they rest, and if the situation suits, they fix themselves, if not they move on in the same manner to some other spot. If the change be only for a short distance, as from one part of the leaf to another, they bend their campanulate rims and bring the tentacula in contact with the focus, and by them adhere to it; the foot-stalk is then loosened, thrown forward, and twirled about, till it meets with a place to suit it; it is then fixed and the tentacula are loosened, and in this way they move from one spot to another. They sometimes also move like the *Actinæ* by a gliding motion of the stalk.

In taking their prey they remain fixed, with their tentacula expanded, and if any minute substance comes in contact with any of the tufts, that tuft contracts, and is turned to the mouth, while the others remain expanded watching for prey.

The differences between this and Dr. Johnston's specimens are as follows. The brown glandular bodies of the free rim proceed from the tentacula in this, while in Dr. J.'s there is a slight distance between them; this may arise from the advanced state of the ova in my specimens. In this the chains of glands from the tentacula unite in pairs at three-fourth's of the length of the body; in the others they proceed singly to the base. In this, the footstalk is distinctly separate from the campanulate rim, in Dr. Johnston's it is said to be sessile, and there is no distinction between the base and the other part. The peduncle, or foot, terminates in a flat, sucker-like expansion while in the other, both in the figures and description, it is absent. These characters have not been observed in a single specimen only, but in scores, and may therefore be considered permanent variations or characters.




find that the external characters of the Radiata are engrafted on a type of tunicated Mollusca: characters, though distinct from each, which yet soften away into both. Some of the polypes of this order have been arranged by most authors among the Hydroidæ, in consequence of their polypidoms resembling those of the Sertulariadae. By the examination of their polypes, however, they are now transferred to the Molluscan zoophytes; and this grouping seems far from being unnatural, even when their external forms are considered. Whatever alteration may be made in the future arrangement of these creatures, when they shall have been more thoroughly studied, yet the making the polype the foundation on which to rest, is the only true one to guide the systematist. The order is characterized as "*Polypes aggregate, the mouth encircled with filiform, ciliated, retractile tentacula; stomach distinct, with a curved intestine terminating in an anus near the mouth; ova internal. Polypidoms very variable; either horny, fistular, and conserved, or membranous or fibro-gelatinous; formed of cells connected and arranged in a determinate, and usually quincuncial manner.*"

As the polype, therefore, forms the foundation of the arrangement, it will be necessary to describe it, though without entering into minute detail. In its expanded state it stands prominently from the cell; it is columnar and transparent, so that the internal structure can be seen. Between the surface of the polype and the internal organs, there is an intervening space, similar to what has been noticed in the Asteroid zoophytes. This space is said to be occupied by a clear fluid; and here also are the muscles, by which the polype effects its various and rapid motions. The upper portion of the column is surrounded with numerous long slender tentacula. In the foregoing orders it has been found that the chief uses of the tentacula were for the capture of prey; here their functions have undergone a complete revolution, for to them belongs the function of respiration, and in a secondary degree only that of nutrition. If an expanded polype be examined with a microscope, it will be found to resemble a minute and delicate flower endowed with sensation and voluntary motion. The tentacula which are long and slender, are clothed with numerous minute cilia, which are in a constant state of activity. By their vibrations numerous currents pass over the tentacula and across the oral surface. Any insect or other substance coming within these currents, passes over the mouth, and in so doing it is instantly caught by the prehensile lips, which are exceedingly sensitive, and conveyed to the stomach. Thus we see both offices are performed by one set of organs, one being made subservient to the other. These tentacula, like

those of the two preceeding orders, are, according to Farre, tubular with terminal apertures.

The mouth, which is powerfully muscular, is situated in the centre of the oral disc, and opens into a long, large, tubular canal which terminates either in a gizzard or the stomach. This canal, which may be called an œsophagus, is powerfully muscular and very easily excited into action. When a polype has succeeded in capturing its food, it is conveyed into this œsophagus, which instantly contracts on it, and by a series of graduated contractions and relaxations forces it onwards under great pressure, to the gizzard or stomach. It is marked in different parts of its length, especially in its superior portion, by numerous closely arranged circular spots; at each extremity it seems more opaque than at any other part, as if its two openings were guarded by circular muscles; which is probably the case. In some species this canal opens into the stomach; but in others it terminates in a powerful organ which has been called a gizzard. This gizzard, from its inequalities of light and shade, appears to be of unequal thickness; but there are always two dark spots, or circumscribed bodies, placed opposite each other. Sometimes the circumference of each of these spots is plain; at others marked with radiating lines, apparently formed of folds. After numerous examinations it seems to me most probable that muscular fibres radiate from these points over the whole organ, and consequently when they act, these points are brought into close approximation, and in their motions grind the food down to a pulp fitted for digestion; and such a distribution of fibres would also produce the folds occasionally seen. This organ opens inferiorly into the stomach, which is a long, large muscular sac extending to the base of the cell. It is semi-opaque, and very irritable; its surface is marked



The food in the stomach has a rapid rotatory motion while it remains there, and is conveyed through the terminal tube in the same manner. Dr. Farre in an elaborate and excellent article on this subject says this rotatory motion is effected by vibratory cilia, similar to those of the tentacula.

Even from this brief notice of the anatomy of the polypes it will be seen that they are considerably elevated above those of the foregoing orders; and their activity and intelligence are equally superior. When fully expanded and in search of prey, turning from side to side, with their tentacula in constant and graceful action, they seem like animated flowrets; but the suddenness of their disappearance is almost beyond belief; more resembling the visions of a fairy tale than any reality. How this is effected will now be explained. The principle is alike in all the families, however widely they may differ in external characters. For the sake of brevity, it will, therefore, be described only as it occurs in the *Vesiculariadae*, &c. The cells in this family for the most part, resemble grains of wheat in shape. In these, the polype hides itself. The inferior portions of the cells are inflexibly horny, while the upper parts are thinner and more membranous. On the internal surface are distributed a few flat muscles, which are attached to different parts of the polype; thus for instance, one is attached to the base of the stomach and the base of the cell; others at the sides of the cell and to corresponding parts of the polype; their origins or fixed points always being below their insertions. These are the muscles which belong to the polype; there are others which belong exclusively to the cell. The upper portion of the cell, being membranous and flexible, is operated on by muscles which having their origins on the upper part of the inflexible portion of the cell, then ascend and are inserted into the thin edge of the orifice. Here then we see there are two sets of levers, arranged in the best possible manner for rapidity of effect. By them the polype can be instantaneously withdrawn, and the opening drawn closely and tightly together.

The upper rim of the cell, when the polype is expanded, is found to be surmounted by a coronet of long delicate bristles, which are held together by a membranous connection; and when the polype is withdrawn, these remain closely compacted in an upright position at the entrance of the cell. The muscles are composed of simple fibres, of nearly equal thickness throughout, and with but very slight attachments to each other. They are in fact the simplest form of muscle I ever saw. This then is the mechanism of the rapid movements of the polype; but the way in which they protrude is not so clearly to be explained. The retractor muscles being in a relaxed state, the sides of the polype which are also said to



be formed of circular muscles, press on the fluid contained within the polype and force the weakest part, and consequently the creature ascends through the mouth of the cell; and Dr. Farre thinks that the stomach has a power also of lengthening itself, and so assisting the protrusion. But whatever power produces it, the expansion is very gradual. As the polype lies in the cell, it is drawn into an S configuration, and thus may be said to be packed away in a very small compass. It must not be supposed that all the structures here mentioned can be viewed in a single specimen; it requires a good microscope, good light, and repeated examinations; for at first all seems confusion. The polygidoms of this order vary greatly in size, appearance and structure. But although there have been reasons to consider the solid parts of the foregoing orders as organic, an opinion which is opposed by many, yet here their organic character is allowed, and the point need not therefore be enlarged on. The solid parts are here properly considered to be continuations of the external parts of the polype.

The arrangement of the horny cells of the first family varies; in some they are arranged in parallel companies, like Pan's pipes, in others in irregular clusters, and in a few they are without any definite order.

With the exception of those genera forming the family Vesiculariadae, already mentioned, the whole belonging to this order are either calcareous or membrano-calcareous. Those species forming the genus *Crisia* bear a great resemblance in form to the *Sertularia*, among the *Hydroida*; with which they were formerly associated. They are arborescent, and the centre of the trunk, branches and cells are occupied by a vital pulp, from which the polypes are developed. The polypes are thus united into one compound animal as in the first order. The growth of the polygidom

agency of life. The *Hippothoa*, and all the encrusting species grow very similarly. From one, and sometimes from three points in *Hippothoa*, a gelatinous transparent looking substance is effused of the length, breadth, and form of the future cell, and in this the lime is soon deposited in the form of a perfect cell. The *Tubuliporidae*, from the earliest periods in which they can be observed have open mouths; in a very early state, the polype may be said to exist without a tube, since the calcareous portion forms but a base for the cell, but as the polype elongates the tube also increases in length.

Whatever opinion may be entertained regarding the polypidoms of the foregoing orders, those now under consideration are generally allowed to have an organic connection with the polype; but the evidence does not appear to be more conclusive here than in the other orders. In the Sea Mats (*Flustra*) and the kindred genera, the manner in which their organic nature can be ascertained, can be seen to the best advantage, and to these a few observations will be directed.

The encrusting species vary a great deal in shape, which depends in a great measure on their different modes of growth. The *Hippothoa* has three points only from which growth takes place: the terminal, which is the most fruitful, and one on each side of the cell. At these points a semi-fluid transparent substance is effused, of the form of the cell; and hence in young specimens the cells are connected together like loosely strung beads. In old specimens, where each cell has had time to extend its growth from the three points, it greatly resembles an irregular *Flustra*. In the *Flustra membranacea*, an exceedingly delicate and gauze-like species, there appears to be only one spot for extension, which is not a point, for it extends over all the distal surface of the cells; but this gives rise to another which may be called accidental, since it arises from a peculiarity in the cell. The terminal or longitudinal increase is produced by an effusion of a semi-solid gelatinous substance, which is called a pulp, and in which the cells are formed. This pulp extends to a certain distance, differing in different specimens, which marks the extent of the growth for one time. In a very short time after the pulp is effused, faint white or milky looking streaks are observed to traverse the pulp in a longitudinal direction so far as the pulp extends. These lines form the lateral boundaries of the future cells. At first the lines are faint, but they soon become distinct and well defined. Faint milky lines are then observed to pass transversely and thus divide the space into quadrangular compartments: these are much stouter than those first formed. The form of the cell now being completed, no further alteration takes place, but the further condensation of the sides and the formation of the



hollow enlargements at the angles, which form their specific differences. So extensive is this effusion occasionally, that I have known ten inches of cells in formation at one time. This form of growth fully explains the great length and the comparatively narrow extent to which this species attains.

In some, and indeed in almost all cases, where the length of the encrustation is great, the longitudinal lines of the cells have a gently arched direction outwards. This arises from the manner in which the lateral increase is effected, and which may be termed the *intercellular* increase. As the cells lie in their linear direction they gradually get wider as they get more distant from the centre of growth. In this manner every eighth or tenth cell has so far increased in size, that two smaller ones are formed on its extremity; these also increase in breadth, and hence a continued intercellular enlargement takes place. The outer rows of cells are thus necessarily forced into the arched form, from these internal wedges. This is the chief if not the only mode of lateral increase. If any obstruction is offered to the longitudinal growth, such as an orifice in the frond or any inequality of the surface, the cells will take a circuit and meet on the other side. If however the polypidom be injured laterally, a small quantity of the pulp will be effused there; and the cells formed in it will be in the direction of the effusion, or at right angles to the original source. So that the direction of the lines of the cells, is indicative of the point from which the pulp was effused. In the Hairy Sea Mat (*Membranipora pilosa*) a lateral increase takes place differently, but showing the same fact, that a calcareous deposit takes place in the pulp, and is but a continuation of the same process that caused the effusion of the matrix.

In the calcareous species, such as *Cellepora pumicosa*, *Eschara*, &c., the formation of the cells is equally apparent;

which in their most perfect condition are well defined and distinct from each other, become confused, from having intervening depressions filled up with calcareous matter, and the interspaces or meshes on the surface disappear from the same cause. In this way all the specific characters are destroyed; the surfaces become plain and even, and the apertures look like minute orifices in a plain incrustation. The apertures, like the surface, lose their specific distinctions and become smaller, till by the continued deposit of calcareous matter, they become obliterated and the polypes thus become enclosed in graves of their own making. This being the case, a further effusion of pulp takes place on the surface of the destroyed cells; in it new cells and polypes are developed, to be again destroyed by the very process which gave them life. Thus we see

“—————The living pile ascend,  
The mausoleum of its architects,  
Still dying upwards as their labours closed.”

From these repeated obliterations it is, that many species become so irregular in shape; a remarkable instance of which is found in the common pumice stone coralline, (*Cellepora pumicosa*.)

We thus see that the external surface of the cells is perpetually undergoing changes of a very marked character. Is this consistent with an extravascular and inorganic character?

If these calcareous cells, in reality have no organic character, but are merely formed by, or are an exudation from the pulp, or from a secreting membrane, it is evident, that after their first formation they could undergo no alteration either in form or character, except what would arise from a chemical or mechanical change in their structures. The external surface once formed, would remain for ever beyond the influence of the polype within. If inorganic bodies be surrounded by highly organized tissues, life is sometimes sufficiently powerful to cause their removal. But in the case under consideration, the lime is not moulded on the pulp, by a mantle, as in shells; but is formed in and by the pulp itself, and a continued deposition is going on. If the external layer be beyond the influence of life, the lime ought to be deposited on the internal surface as being most in contact with the exuding pulp, and thus, the cavity of the cell would become filled and solid, rather than the fissures of the exterior. But the exact reverse of this is the case. In some species, such as *Cellepora cervicornis*, and *ramulosa*, the *Sea Mats*; *Eschara foliacea*, and others, the whole process of formation, from the embryo, to the perfect and obliterated cells, can be observed; so that no difficulty can arise for want of opportunities to test these opinions. In

further confirmation of these views, it may be briefly noticed, that if the cells be placed in acetic or dilute nitrous acid, all the carbonate of lime is removed, and the undoubted organic portion of the cells looks but slightly altered from what the cells were before the obliteration took place. If the experiment be reversed and a specimen be boiled in caustic potash, the organic matter is removed and the spongy calcareous case remains perforated or porous from the removal of the matter which formerly pervaded the whole. Thus then it seems clear that the polypidoms are organic.\*

The mode of reproduction in this order varies a great deal, and in many genera it is entirely unknown. In the genus *Crisia*, which we have noticed as resembling *Sertularia*, it is effected by the periodic formation of ovarian vesicles. As the formation of these cells is very similar to that of those described among the *Hydroidæ*, little need now be said on the subject. In them the *ova* or *gemmules* are formed from the vital pulp, which at first occupies the whole of the cavity, but as development advances, it is withdrawn towards the centre. It is of the same consistency as the pulp which traverses the centre of the polypidom, and in fact is a continuation of it. It very soon becomes developed into globular *gemmules*, which are clothed with numerous vibratory cilia, that are in constant action. By these, after the *gemmules* have escaped from the vesicle, they are whirled about in a rotatory manner through the surrounding fluid, like worlds in miniature. Like the *gemmules* of the *Hydroidæ* they at last become fixed, and like them spring up into delicate and beautiful arborescence; but they are calcareous instead of horny. After having performed their functions, these organs drop off and disappear, or are thrown off like

success; it seem probable therefore, that they are but sparingly developed. The form of these organs is urn-shaped, with short tubular orifices superiorly, which are placed a little on one side; inferiorly they contract into short and bent peduncles, which from their calcareous structure must necessarily be very brittle.

In some of the Sea Mats, the reproduction is also effected by what may be called ovarian vesicles. In the *Flustra membranacea* for instance at certain seasons of the year, long membranous sacs are seen protruding from the cells; they are of a yellow colour semi-transparent, and filled with minute yellow granules which appear to be ova. They grow from the side of the cells; at first they are so small as to cause no apparent inconvenience to the polype; but as it increases in size the polype suffers considerably, and finally dies. The sac then occupies the whole of the cell. It is not in every cell that they are developed, for they are irregularly distributed over the whole polypidom. From the minute and delicate nature of the polypes it is impossible, with our present means, to discover whether their formation depends on any peculiarity in the polype itself, or is the result of accidental causes. From the irregularity of the development, however, it seems to be governed by no law. Some authorities doubt that this is the true function of the sacs, but from what I have observed I have but little doubt on the subject.

In *Tubularia* and the kindred genera, the gemmules are formed interiorly, and may occasionally be seen escaping in the shape of minute ciliated grains, which move about freely from spot to spot, but shortly become fixed rooted and assume their adult specific forms. This mode of reproduction, observed so extensively among Zoophytes, is among the most curious in nature. In the first place we observe minute grains clothed with cilia which are in constant action, and by which they move freely about with all the irregularity of voluntary motion; in the next they become rooted and grow into various arborescent forms, endowed with unequivocal marks of animal life; changes which even the wildness of imagination would hardly have conceived. But if we turn to any department of nature, we shall be surprised at the inexhaustable gradations of form and diversity of phenomena; and their almost miraculous termination in results and forms, the very best that could have been devised for the situation each is destined to occupy in the scale of being. However obtuse our intellects may be, these things will force themselves on our attention; and to the naturalist, they form one of the chief sources of his pleasures.

This order is the most extensive of all and embraces great diversities of form, though a similarity of polype. If other shores are equally productive with our own, and many will be more so, it will have to be divided and sub-divided into small groupings if only for the convenience of study. At present no alteration is required, the system here adopted being quite sufficient for the convenience of future investigations.

#### VESICULARIADÆ.

Polypidoms horny, fistular, confervoid; cells vesicular, deciduous, non-operculate.

#### VESICULARIA.

**Generic Character:** Polypidoms rooted, confervoid, fistular, horny, dichotomously branched, jointed at the divisions: cells ovate, disjunct, uniserial and unilateral. Polypes ascidian.

**SILK CORALLINE.** *V. Spinosa*. Stem erect, compound, branched dichotomously; cells on one side. Pl. xvii, fig. 1.

*Conferva marina cancellata*, Raii, Synop., vol. 1, p. 59. *Sertularia spinosa*, Ellis and Solander's Zooph., p. 48. Stewart's Elem., vol. 2, p. 446. Silk Coralline, Ellis' Coral, p. 20, pl. ix., fig. 17, B. *Sertularia spinosa*, Turton's Lin., vol. 4, p. 682. *Laomedea spinosa*, Lamouroux's Cor. Flex., p. 208. Templeton in Mag. Nat. Hist., vol. 9, p. 466. *V. spinosa*, Fleming's Brit. An., p. 551.

**Hab.** On corallines from deep water, off the Deadman, rare.

Confervoid, horny, fistular, and of a semi-transparent membranous texture; branched; branches long and zig-zag, slender and jointed. It is erect, slender and varies in height



no. 24, pl. 15, fig. b B. *Sertularia lendigera*, Ellis and Solander's Zooph., p. 52. Turton's Lin., vol. 4, p. 682. Stewart's Elem., vol. 2, p. 445. *Serialaria lendigera*, Fleming's Brit. An., p. 547. Templeton in Mag. Nat. Hist., vol. 9, p. 467. Johnston's Brit. Zooph., p. 251, fig. 40, p. 249. *Amathia lendigera*, Lamouroux's Cor. Flex., p. 159.

*Hab.* On the roots of sea weed, about and beyond low water mark. Talland sand bay, Polperro, Lantivet and Lantic bays. "Goran Haven," *Mr. Peach*. Port Pean. Common.

The appearance of this coralline, as Dr. Johnston has said, "resembles a flock of hair with clusters of nits scattered over it." The stem and branches are about the size of hair, hollow, and spreading dichotomously, jointed, the lower part of the joint pointed, the upper enlarged, and on this enlarged part, the cells are arranged in companies of from four to eight, and each cell is parallel to, and in connection with the next. They resemble "Pan's pipes" in miniature. The mouths of the cells are irregular.

VALKERIA. Fleming.

*Generic Character*: Polypidoms confervoid, horny; cells ovoid, sessile, irregularly grouped together, with contracted terminal apertures.

GRAPE CORALLINE. *V. Uva*. Polypidoms creeping; cells irregularly distributed, apertures terminal. Pl. xvi., fig. 6.

Grape Coralline, Ellis' Coral., p. 27, pl. xv., fig. c C D. *Sertularia uva*, Ellis and Solander's Zooph., p. 53. Turton's Lin., vol. 4, p. 682. Stewart's Elem., vol. 2, p. 445. Templeton in Mag. Nat. Hist., vol. 9, p. 466. *Valkeria uva*, Fleming's Brit. An., p. 551. Johnston's Brit. Zooph., p. 253.

*Hab.* Parasitical on the Sea-oak; abundant about October.

This species climbs over fuci and corallines, by means of its horny tubular fibres, and produces its cells at intervals, either singly, or in clusters, of from three to eight. The cells are large, and in shape resemble grains of wheat; they are attached at one point below, and free at all the rest. The aperture is terminal and closed. The polypes have eight ciliated tentacula. When living, the cells are smooth; when dried, they become wrinkled, as Ellis has figured them.

VALKERIA IMBRICATA. Confervoid, horny, irregularly, but somewhat alternately branched; cells in irregular, and dense clusters, sometimes in single rows, ovoid, Pl. xvii., fig. 2,

*Sertularia imbricata*, Turton's Lin., vol. 4, p. 683. Stewart's Elem., vol. 2, p. 450. *Serialaria imbricata*, *Sertularia verticillata*, Templeton in Mag. Nat. Hist., vol. 9, p. 467, fig. 66.

*Hab.* On fuci near low water mark. Polperro. Not common.

This is a small confervoid species of a light brown or horn colour, and is parasitical on different species of fuci near the shores. Its stem is formed of a semi-transparent zig-zag line, and gives off its branches very irregularly, but in somewhat an alternate manner. It is generally creeping and frequently covers a surface of several inches in extent, from which a few tufts arise erect. The cells arise irregularly on various parts of the polypidom, in dense clusters or in single rows; they are ovate with contracted terminal apertures and are deciduous. The stem and branches are frequently marked with round or oval apertures, which are the marks of cells which have fallen off. The polypes are very active and have eight ciliated tentacula, they appear to be very timid; they protrude themselves, so far as the tentacula very slowly, but afterwards quickly; but the least motion, or shade will make them contract in a very sudden and unexpected manner. The cells to be seen in a perfect state must be examined while the specimen is recent, for when it is dried, they frequently fall off and always look different from nature; this observation applies not only to this, but to all these horny fistular species, so that descriptions taken from dried specimens will not frequently apply to the living.

**DODDER CORALLINE.** *V. Cuscuta*. Creeping, slender, horny, branched; branches opposite, nearly perpendicular to the stem; cells ovoid, numerous, crowded.

Pl. xvii., fig. 3.



polypidom is divided into internodes of nearly equal lengths, and about three times as long as the transverse diameter; these, however, are hardly visible but in dried specimens. The cells are oval, numerous, crowded, sub-pedunculated, and not congregated into companies. They are somewhat irregular in size, but are generally about twice as long as the diameter of the branch. The polypes are very active with eight ciliated tentacula.

There are several discrepancies between this account, and those given by Ellis, Fleming, Thompson and Johnston, but if we suppose their descriptions to have been taken from injured specimens, this in a similar condition closely resembles them, otherwise it must be considered a new species.

### CRISIADÆ.

Polypidom calcareous, or sub-calcareous, branched, confervoid, jointed; the cells linked together in one or more series, distinct, tubular or elliptical, with a terminal or sub-terminal aperture, never closed with an operculum.

CRISIA. Lamouroux.

*Generic Character:* Polypidom confervoid, rooted by tubular fibres, dichotomously branched; the cells long and tubular, linked together in one or two series, the apertures round, terminal, and produced. Polypes ascidian.

\* *Cells linked in a single series.*

GOAT'S-HORN CORALLINE. *Crisia Cornuta*. Cells long and tubulous, with a curved termination, having a long bristle at the joint above each cell. Pl. 17, fig. 4.

Goat's-horn Coralline, Ellis' Coral., p. 42, no. 10, pl. 21, fig. c C. *Cellaria cornuta*, Ellis and Solander's Zooph., p. 25. *Sertularia cornuta*, Stewart's Elem., vol. 2, p. 449. Turton's Lin., vol. 4, p. 686. *Eucratea cornuta*, Lamouroux's Coral. Flex., p. 149, no. 260. Fleming's Brit. An., p. 541. *Crisia cornuta*, Johnston's Brit. Zooph., p. 260, pl. 31, figs. 1 and 2. Templeton in Mag. Nat. Hist., vol. 9, p. 469.

*Hab.* On fuci and corallines, rare; on the sides of the Corwich crab mixed with *Crisia eburnea*, common. Polperro, Lake Rock, Mevagissey and Whitsand bays.

It is calcareous, confervoid, about half an inch in height, and is formed of a single row of cells, bent near their apertures, and placed one above another; it is slender, erect, very brittle, alternately branched, and rooted by calcareous, tubular creeping fibres. Above the beaked termination of each cell is a long bristle, which is generally broken off in preserved specimens. The apertures of the cells are even



everted, and all turned one way. Ellis figures some oval-shaped vesicles, arising from the base of the cells, speckled, with a small tube at the back; this is of rare occurrence, for I have never seen it.

I am inclined to think that two species have been included under this name. In Turton's edition of Linnæus, vol. 4, page 686, it is said, "*Denticles alternate* with a single hair on the top of each," and in Stewart "*denticles alternate*," whereas this species has only a single row of cells which are all turned one way, and Lamouroux by placing it in Eucratea, makes it to have only one row, "*Polypier phytoïde, articulé; chaque articulation composée d'une seule cellule simple et arquée; ouverture oblique*;" and Fleming, "Branches consisting of a single row of bent cells." I have made these references because I have met with two specimens, of what appeared at the time to be deformed specimens of this species, in which, although the cells might be said to be uniserial, yet their bent necks and apertures, were alternately turned in opposite directions, and hence might be said to be alternate, and the bristles, instead of being above, were beneath the apertures, which would nearly correspond to the description of Linnæus and Stewart.

**BULL'S-HORN CORALLINE, *C. Chelata*.** Cells in the form of a shoe; apertures oblique, with a slightly tubular rim, and a short tubular spine beneath. Pl. 18, fig. 1.

Bull's-horn Coralline, Ellis' Coral., p. 42, no. 9, pl. 22, fig. b B. Cellaria chelata, Ellis and Solander's Zooph., p. 25. Sertularia loricata, Turton's Lin., vol. 4, p. 686. Stewart's Elem., vol. 2, p. 449. Eucratea loricata, Fleming's Brit. An., p. 541. Eucratea chelata, Lamouroux's Cor. Flex., p. 140, no. 201. Loricula loricata, Temptamen

a Wellington boot cut off at the neck, with the toe below and heel above. The aperture is oval, subterminal, or like the opening of the shoe; in the dried state it has a thick, short, tubular rim, which in living specimens is not apparent. Beneath the rim there is frequently seen a short tubulous spine; this is the rudiment of another cell. This is proved by many specimens showing the different gradations to the perfect cell, and that all the branches arise from this situation, while the other cells are attached to each other by the heel and toe. When the specimens are living, the cells are so transparent that the polype may be seen through; so that when the animal is expanded two muscles are distinctly to be seen, one attached to the base and the other to the back of the cell, and the animal is found to be encased in a close tubular sheath, to which the muscles are attached, and which is partially protruded when the polype is expanded.

\* \* Cells paired with a joint between each pair.

**TUFTED IVORY COLALLINE.** *Crisia Eburnea*. Cells loosely aggregated, cylindrical, bent, tubular; orifices free. Pl. 18, fig. 2.

Tufted Ivory Coralline, Ellis' Coral., p. 39, table 21, no. 6, fig. a A. *Sertularia eburnea*, Turton's Lin., vol. 4, p. 686. Stewart's Elem., vol. 2, p. 449. *Cellaria eburnea*, Ellis and Solander's Zooph., p. 24, no. 7. *Crisia eburnea*, Lamouroux's Cor. Flex., p. 138, no. 244. Fleming's Brit. An., p. 540, no 156. Templeton in Mag. Nat. Hist., vol. 9, p. 468. Johnston's Brit. Zooph., p. 262, pl. 31, fig. 3, 4.

*Hab.* On the roots of sea weed, and the sides of the Corwich crab, abundant. Talland sand bay, Whitsand bay, Lantivet bay, St. Austle bay, Polperro, Port-Holland beach. On the crumb of bread sponge. Common.

This white calcareous zoophyte varies in height from one-fourth to one inch, and grows in white ivory tufts, many of which are sometimes united to each other at intervals by a creeping fibre. The polypidom is sometimes much branched, and always in an alternate manner. The cells are biserial, tubular, with free apertures, are loosely aggregated, and nearly opposite. They are frosted, or marked with minute dots with plain transparent centres. In young specimens, the branches all arch inwards, and give the small tufts a pretty appearance. The vesicles are very rarely to be found. They are rough or frosted, and somewhat urn-shaped with narrow tubular necks, which are not placed in the centre.

**BLACK JOINTED CORALLINE.** *Crisia Luzata*. Cells closely aggregated, cylindrical, nearly straight, with short tubular orifices; joints black. Pl. 18, fig. 3.

*Crisia luxata*, Fleming's Brit. An., p. 540. Johnston's Brit. Zooph., p. 262, pl. 31, fig. 5, 6.

*Hab.* On the roots of sea-weed, corallines, back of the Corwich crab, very common. Lantivet bay, Talland sand bay, Polperro, Whitsand bay.

This species bears a very close resemblance to the last. It is calcareous, jointed, erect and about one inch in height; it grows in small and elegant tufts which are united to each other by hollow, calcareous, black jointed tendrils. The root, immediately below the first internode is straight and narrow, but above is large and globular and from its inferior surface numerous slender jointed tendrils proceed, embracing the surface on which it grows and firmly root it to the spot. It is dichotomously branched, and in young specimens, the branches all arch inwards. The cells are biserial, semi-alternate, tubular, adnate, frequently rough or frozen, and speckled. The apertures are oblique, and slightly uneven. The joints are black, which give the polypidom a speckled appearance; the internodes are of various lengths and bear an unequal number of cells; below, they are narrow and gradually dilate into the two lower cells. Beside the hollow tendrils which form the roots, others arise from various parts of the polypidom near the joints, which are also hollow, jointed, and assist the rooting the polypidom to the spot.

This is a more robust species than the last, and has its joints always black. The cells are sometimes prominent and the apertures divergent, as in the *Crisia eburnea*, but as it is always black jointed and much stouter it cannot be mistaken.

NOTAMIA. Fleming.

*Generic Character:* Polypidom plant-like, sub-calcareous,

This species on our coast attains about three inches in height, but is more commonly found about one. It is of a light brown colour, and though much and dichotomously branched, is not spreading, growing much like a poplar tree; the branches are slender and formed only of the cells, which are united in pairs, with a joint between each pair. The cells are opposite, united at their backs, smooth and obliquely truncated. The appearance of the cells thus united is aptly said by Ellis, "to resemble a coat of mail or pair of stays; and the entrances of the cells look like the places for the arms to come out at." The polypes have ten ciliated tentacula, and are very active.

**HIPPOTHOA.** Lamouroux.

**Generic Character:** Polypidoms confervoid, adherent and creeping, calcareous, irregularly branched, the branches frequently anastomosing, formed of elliptical cells linked to each other at the extremities; aperture lateral, near the distal end. Polypes ascidian.

**BEADED CORALLINE.** *H. Catenularia.* Cells egg-shaped, smallest end towards the centre of growth; aperture large, oval, and at the larger end. Pl. xviii., fig. 5.

*Hippothoa catenularia*, Fleming's Brit. An., p. 534. Johnston's Brit. Zooph., p. 264, pl. 31, figs. 9 and 10.

**Hab.** On the *Pinna ingens* and *P. rotundata*, very common. Polperro; Deadman point.

This is to be found on almost every *Pinna* drawn from deep water off the Deadman point, and west to the Lizard. It is a small bead-like coral, running over the surface of the shell. It is adherent throughout, and formed of egg-shaped cells linked together at their extremities. The larger end, placed distally, is occupied by the aperture, which is oval, and sometimes very large with a plain thickened rim. As it trails over the surface of the shell it is much and variously ramified. The ramifications arise at nearly right angles from the margins of the cells opposite the lower margin of the orifice, and frequently cover two or three inches of surface. Sometimes the cells are so thickly arranged as to be placed in juxtaposition over half an inch of surface, in such a case it very closely resembles a *Flustra*; and on three occasions it was only by examining the free cells of the circumference that the character of the polypidom was determined. When thus jointed into a *Flustra*-like form, the cells appear inflated, and the apertures immersed; sometimes the surface is smooth and the situation of the cells only marked by the rounded apertures. In its more usual form it is variously ramified and resembles, as Dr. Johnston has

said "many of the plant-like figures in marble and agate." When recent, the cells look in a reflected light like minute pearls, and may then easily be removed from the shell to which they are attached.

**SMALLER-BEADED CORALLINE.** *H. Lanceolata.*

Cells small, slender, and ovoid; aperture round, very small, and nearly terminal. Pl. xviii., fig. 6.

*Hippothoa lanceolata*, Johnston's Brit. Zooph., p. 265.

*Hab.* On the Pinna ingens off the Deadman point, common. *R. Q. C.*

A very similar species to the last, but much more delicate. The cells are very minute, pearly, translucent, ovoid, and not so much bulged distally as in the last. The mouth, which is scarcely visible even under a pocket lens, is round, with a raised margin, and nearly terminal. The cells are distant, and connected with each other by a very slender white thread of about twice the length of the cell. It is much and irregularly ramified, each branch is given off at the side and about the middle of a cell. This species retains its pearly lustre even when preserved in cabinets. It is so minute, that it would entirely escape observation if it was not especially looked for, or if the surface was not examined attentively with a lens. It is as common as the last species, and found on the south coast, wherever the Pinna occurs.

**HIPPOTHOA SICA.** Encrusting; calcareous; cells spear shaped; large end placed distally; apertures small sub-terminal. Pl. xix., fig. 9.

*Hab.* On stones from deep water, common. Polperro, Goran.

This species of *Hippothoa* differs so decisively from the two described above, that there can be no doubt of its being



**SNAKE CORALLINE. *A. Spatulata*. Pl. xix., fig. 2.**

Snake Coralline, Ellis' Coral., p. 43, no. 11, pl. 22, fig. c C D. *Cellaria anguina*, Ellis and Solander's Zooph., p. 26. *Sertularia anguina*, Turton's Lin., vol. 4, p. 686. Stewart's Elem., vol. 2, p. 449. *Cellaria anguina*, Templeton in Mag. Nat. Hist., vol. 9, p. 466. *Anguinaria anguina*, Fleming's Brit. An., p. 542. *Anguinaria spatulata*, Johnston's Brit. Zooph., p. 266, pl. 31, figs. 7 and 8.

*Hab.* On shells occasionally, but more frequently on the smaller sea-weed. Polperro, Talland sand bay, Looe island, Mevagissey bay, &c.

Creeping; cells arising from a creeping fibrile, erect, free, and calcareous; they resemble spoons which have the bowl bent with the concave portion towards the handle. That part of the creeping fibre from which the cells arise, is enlarged and bulbous; under the microscope the cells appear to be circularly striated, as it is figured by Ellis. The enlarged and bent heads of the cells are dotted, and frequently infested with minute *Confervæ*. The apertures are sub-terminal, inferior, and ovoid. When dead it is of a pure white colour, when living of a delicate pink. This minute species, though not abundant is common, especially in the latter part of Summer and Autumn.

**TUBULIPORIDÆ.**

Polypidoms calcareous, or membrano-calcareous, variable in shape but never confervoid; cells tubular, rising from a base and projecting; the apertures terminal and non-operculate.

**TUBULIPORA. Lamarck.**

*Generic Character:* Polypidoms attached by a partial or entire adhesion of the base, sometimes crustaceous; cells placed on a calcareous basis, arranged in rows, long and cylindrical, separate with an erect aperture. Polypes ascidian,

**WART-LIKE CORALLINE. *T. Patina*. Centre cupped, circumference plain, midway between raised, and bearing erect tubes with round unarmed apertures.**


*Millepora verrucaria*, Ellis and Solander's Zooph., p. 137. no. 13. *Madrepora verrucaria*, Turton's Lin., vol. 4, p. 616. Stewart's Elem., vol. 2, p. 426. *Discopora verrucaria*, Flem. Brit. An., p. 530. *Tubulipora patina*, Johnston's Brit. Zooph., p. 267, pl. 30, figs. 1, 2, and 3.

*Hab.* On the Pinna ingens, stones, corallines, and dead-man's hands, from deep water, common.

This small wart-like species is liable to many variations of form arising from the different developement of its various

parts. It may, for the sake of convenience in noticing these variations, be said to be composed of three parts, a central or depressed portion, crowded with cells, a raised or prominent circle round the centre, formed of erect or semi-erect aggregated tubes, and a thin, plain, translucent margin destitute of cells.

In form it very much resembles a miniature soup-plate. It is calcareous, white, sessile, rarely exceeding half-an-inch in diameter, and is attached by the base of the central depression. The depression varies in size from a mere point to about three-eighths of an inch in diameter, and is either round, or very irregularly oval. The surface is occupied by small, semi-horizontal, closely aggregated tubes, with oblique even apertures. The raised circle is also liable to great variations in form. In most cases the tubes rise abruptly from the circumference of the depression, forming well defined fluted sides to the cup; sometimes they rise in gradual succession one above another, forming a gently sloping surface from the margin to the centre; sometimes the surface is arched concavely, at others convexly, and between these extremes there is every possible variation. The sides of the cup are generally uniformly fluted, a furrow being formed by each tube; but sometimes the tubes are arranged in companies, and then, the sides appear formed of fluted columns. The tubes are of equal diameter and lean in a greater or less degree, obliquely outwards. The apertures are generally on one plane, but occasionally rise in radiating ridges; but some will rise singly above the others. The apertures are even and oblique; but sometimes, if the specimen be examined as soon as it is taken, the apertures appear armed with one or two spines, but this appears to me the result of the greater growth of one side of the lip than of the other, for this variation in shape means, consistent, that



that part of the English channel formed by the Cornish coast, it appears that this plain, translucent circumference is the earliest visible process in the formation of new tubes. But though thus liable to so many variations, it must not be supposed that the species is to be with difficulty recognized. It very rarely occurs that more than one variation is found in a single specimen; and all the varieties differ from a standard form; so that it is as easy to distinguish this as any other species.

**TRAILING CORAL.** *Tubulipora*, (*trahens*, R. Q. C.)

Polypidom calcareous, creeping, adherent throughout, irregularly and sparingly branched, narrow, with one or two rows of tubes projecting from the upper surface. Pl. xix., fig. 3.

*Hab.* On stones and shells from deep water, not uncommon; Polperro.

The polypidom varies from a quarter to one inch in length, but is very narrow and slender. It is adherent throughout, trails over the surface of the stones or shells on which it grows, and is tortuously, sparingly, and irregularly branched. The tubes are commonly single, but sometimes are in pairs, and project considerably, sometimes in a straight and at others in a waved manner. When the tubes, are in pairs they are always close together, but each pair is separated from the next in the length ways of the polypidom by an interval varying from one-eighth to one-fifth of an inch in different specimens. Being unable to refer this to any described species, I have provisionally given it the name of *trahens* as descriptive of its habit.

**SMALL PURPLE ESCHARA.** *T. Serpens*. Polypidom calcareous, purple or white; branches bifid, revolute; cells only on one side, long and tubular, in transverse rows separated by a central groove. Pl. xix., fig. 7.

Small Purple Eschara, Ellis' Coral., p. 74, no. 6, pl. 27, fig. e E. *Millepora tubulosa*, Ellis and Solander's Zooph., p. 136, no. 11. *Millepora liliacea*, Turton's Lin., vol. 4, p. 639. *Tubipora serpens*, Turton's Lin., vol. 4, p. 614. Stewart's Elem., vol. 2, p. 426. *Millepora tubulosa*, Stewart's Elem., vol. 2, p. 428. *Tubulipora serpens*, Fleming's Brit. An., p. 529. Johnston's Brit. Zooph., p. 268, pl. xxx., figs. 4 and 6.

*Hab.* On stones, shells, corallines, and sponges, common at all distances. R. Q. C. Pallas.

This species is common at all seasons, and is generally parasitical on the horny corallines, more particularly on the



*Plumularia falcata* ; on which it is very frequently abundant. It is a small calcareous species and generally of a purple or purplish white colour. It grows on a narrow base, is creeping, and dichotomously branched in a revolute manner. The cells or tubes arise from the upper surface only, the lower being plain or only striated from the position of the cells above; they rise in two rows from near the centre of each branch and diverge towards the sides, leaving a central groove which runs through all the branches and gives the polypidom a remarkable and characteristic appearance. The tubes are very prominent, and occasionally distant, with plain round apertures.

If a specimen grows in an unfavourable situation, it will sometimes be curiously distorted. I have specimens which have grown in the crevices of stones in which the branches have been so closely pressed together that they seemed, at first view, as if united into one mass; but an examination soon discovered the branches and the two rows of tubes. In others there have been no branches and the polypidoms have had a simple flat surface, but the peculiar leaning of the tubes was present in all. It varies in length from one quarter to half-an-inch in length; but on one occasion it attained three quarters of an inch and was the largest I ever saw.

**TUBULIPORA PHALANGEA.** Encrusting; polypidoms divided into from two to five lobes; tubes divergent from a central line running through the centre. Pl. xix., fig. 8.

*Hab.* On stones and the wicker work of crab pots, in from ten to twenty fathoms water, common.

This species in its most simple state resembles a deformed condition of *Tubulipora serpens*, with which it has hitherto been confounded. Having examined a great number of

*T. serpens* is a branched species and is generally parasitical on other corallines, while this is an encrusting species and never branched. In the former the tubes are short and in contact, in the latter long and separated from each other, hence there can be no doubt of their being specifically distinct.

**TUBULIPORA.** (*deflexa*, R. Q. C.) Polypidom erect, cylindrical, with waved tubes projecting from all parts. Pl., xix., fig. 5.

*Hab.* On shells from deep water, common. Polperro, Mevagissey bay, and off the Deadman point.

This small species varies in height from a quarter to half-an-inch. It is calcareous, white, columnar, and unbranched; its upper termination is very frequently enlarged into a globular head. The tubes observe no regularity in their arrangement, but arise without order from all parts of the polypidom and project considerably in a bent or tortuous manner. They are shorter below than above, most probably from the older portions being broken off, and the apertures are even and unarmed. The base is slightly spreading and firmly adherent. Though this species is so common as to be found at all depths, yet I cannot find it referred to by any of the authorities to which I have access.

**TUBULIPORA.** (*fungia*, R. Q. C.) Pedunculated; the upper portion expanded into a flat round surface; tubes projecting from the upper part of the circumference; centre nearly plain. Pl. xix., fig. 4.

*Tabipora pennicillata*, Turton's Lin., vol. 4, p. 615.

*Hab.* On shells and stones from deep water, common; from the Eddystone Lighthouse to the Deadman point.

This pretty species is calcareous, and varies to a quarter of an inch in height. The upper portion is expanded into a flat head, having on its superior surface, one, two, or three rows of projecting tubes round the circumference; the centre is either plain or marked with a few irregular cells. The cells are distant from each other, with slightly oblique, unarmed apertures, and lean towards the circumference of the flat surface. Sometimes they are almost even with the surface, and at others project so considerably as to hide all the surface of the disc except the central plain spot. The tubes are rather small in calibre. This species is very common in deep water, and though sometimes found on shells, most commonly prefers thin slate or a red compound mica looking stone.

**TUBULIPORA OBELIA.** Encrusting, calcareous, adherent throughout; cells tubulous, disposed in a radiating manner, generally semi-circular.

*Tubulipora obelia*, Johnston's Brit. Zooph., p. 269, pl. 30, figs. 7 and 8.

*Hab.* On stones and shells from deep water, common, from the Ram Head to the Deadman.

This is entirely an encrusting species. It is circumscribed in its base, and semi-transparent. The tubes are distant, recumbent, tubulous, and radiating from several centres, with semi-transparent inter-tubular spaces. The tubes are most commonly recumbent, as just described, but differ in their appearances; sometimes they are erect, at others semi-erect, and again either prominent or immersed; and in some specimens all these varieties occur together.

**TUBULIPORA HYALINA.** Encrusting, semi-transparent, membrano-calcareous; cells distant from each other, tubular, erect, arranged in one or two circular rows round a plain centre; apertures, unarmed and frosted. Pl. xix., fig. 6.

*Tubulipora hyalina*, 9th Annual Report of the Royal Cornwall Polytechnic Society, p. 73.

*Hab.* On *Fucus palmatus*, rare. Polperro.

This small species encrusts the margins of sea-weed in patches of about the diameter of a pea. The tubes are distant, erect, immersed in the surrounding structure, of equal diameter throughout, and arranged in one or two rows round a plain centre; sometimes there are a few cells irregularly scattered in the centre, but separated from the external set by a plain surface. The apertures are even, un-

**DISCOPORA HISPIDA.** Encrusting, with a circumscribed base, calcareous, ridged or waved; cells coalescent, erect; apertures patulous, armed with one larger and two smaller teeth. Pl. xix., fig. 1.

*Discopora hispida*, Fleming's Brit. An., p. 530. Johnston's Brit. Zooph., p. 270, pl. 30, figs. 9, 11.

*Hab.* On shells, stones, and corallines, from deep water, common. Polperro, Fowey, Goran, &c.

This very common species rarely exceeds an inch, but is most commonly found about one-half or three-fourths of an inch in diameter. It is calcareous, white, and from the juxtaposition of the tubes, very solid. It is not a mere incrustation, for it sometimes attains the thickness of half an inch, but is most commonly about the tenth of an inch in depth. The surface is most commonly uneven, either with gently undulating ridges or papillary eminences; and as the tubes are so small that they cannot be distinctly seen with the naked eye, it looks like a piece of white embossed velvet. The tubes are irregular in size, erect, or but slightly leaning, and the ridges or unevenness of the surface is produced by their unequal growth. The apertures of the tubes are patulous, and sometimes even and unarmed, though most commonly armed with two or three stout conoidal spines; which is probably the manner in which the tubes grow in length.

#### CELLEPORIDÆ.

Polypidoms calcareous, or membrano-calcareous, lobed, ramous or crustaceous, formed of an aggregation of cells disposed usually in quincunx; cells utricular, in juxtaposition with contracted terminal apertures, often covered with an operculum.

#### CELLEPORA.

*Generic Character:* Polypidoms calcareous, or membrano-calcareous, cellular, lobed, ramous, formed of urceolate cells heaped together, or arranged in a quincunx. Polypes ascidian.

**CELLEPORA VITRINA.** Encrusting, calcareous; cells ovoid, very small, pearly, and irregularly arranged. Pl. xxii., fig. 1.

*Hab.* On stones in moderately deep water, not rare. Goran, Mr. Peach. Polperro. Mount's bay.

This delicate and beautiful species, is very small; it is encrusting, circumscribed and rarely exceeding a quarter of an inch in diameter. The cells are small, transparent, vitreous or pearly in their appearance and very irregularly

arranged. The apertures are very minute, and terminal, and cannot readily be seen even with a lens.

**PUMICE-STONE CORALLINE.** *C. Pumicosa.* Encrusting, cells ovoid or sub-orbicular, generally heaped irregularly together, when young arranged in a quincunx; apertures round, armed with three marginal teeth. Pl. xx., fig. 3.

*Porcus eschara*, Ellis' Coral., p. 75, pl. 27, fig. f F., pl. 30, fig. d, D. *Cellepora pumicosa*, Turton's Lin., vol. 4, p. 640. Stewart's Elem., vol. 2, p. 428, pl. 12, fig. 16, 17, copied from Ellis. Fleming's Brit. An., p. 532. Templeton in Mag. Nat. Hist., vol. 9, p. 469. Johnston's Brit. Zooph., p. 273, pl. 32, figs. 1, 2, 3. Bellamy's Nat. Hist. of South Devon. *Millepora pumicosa*, Ellis and Solander's Zooph., p. 135. Turton's Lin., vol. 4, p. 639. Stewart's Elem., vol. 2, p. 428. *Flustra bullata*, Ellis and Solander's Zooph., p. 16. Stewart's Elem., vol. 2, p. 436. Turton's Lin., vol. 4, p. 664.

*Hab.* On stones, shells, and roots of sea-weed, common. Polperro.

This very common species presents itself under a variety of aspects, depending on the character of the substance it incrusts. As it is most commonly found on Corallines, it generally resembles globular pieces of pumice-stone, from whence it derives its name. When living it is of an orange red colour, and sometimes pinkish; but when seen in collections, it is of a light dusky brown colour. It is calcareous, porous, friable, and encrusting. The cells are ovato-globose, round, or egg-shaped, depending on the figure of the substance it encrusts. The apertures of the cells are armed with three marginal teeth, which, from being easily destroyed, are not



**Hab.** Lizard point, Polperro, Goran, Deadman point; common on corallines and stones, from deep water.

This, though a common, is not an abundant species. It is calcareous, and while living, of a delicate flesh colour, which afterward changes to a dull white. It arises from a spreading base by a stout rough cylindrical trunk, and is dichotomously branched. The branches are short, stout, cylindrical, very rough, and the terminal ones end in obtuse points. The cells are numerous, urceolate, and in the young state, appear to be quincuncially arranged, but afterwards to be without regular order. The apertures are contracted, and armed with a long stout spine on the outer margin. It varies in height from one to three inches.

**C. SKENEI.** "Much compressed, divided in a bifid manner, rough; cells rowed, with a strong mucro on the outer edge of the aperture." *Skene*.

*Millepora Skenei*, Ellis and Solander's Zooph., p. 135. Turton's Lin., vol. 4, p. 635. Stewart's Elem., vol. 2, p. 427. *Cellepora palmata*, Fleming's Brit. An., p. 532. Johnston's Brit. Zooph., p. 274, pl. 32, figs. 6, 7, 8.

**Hab.** On stones and the Pinna ingens, off the Deadman, rare.

This is a smaller and more compressed species than the last and rarely exceeds half an inch in height. It is sparingly and dichotomously branched; the branches are short, palmate, and truncated. The cells are urceolate, rather immersed, except in the newest parts, and somewhat spirally arranged; the apertures are slightly oval, but are in a great measure hid by a strong stout spine on the outer lip. This shape and arrangement of the cells give them a resemblance to a fir cone, in which the scales are loosely arranged.

**STAG'S-HORN CORAL.** *C. Cervicornis*. Polypidom calcareous, much and irregularly branched; branches palmate, truncate, marked with small pores, quincuncially arranged.

*Millepora cervicornis*, Turton's Lin., vol. 4, p. 635. Stewart's Elem., vol. 2, p. 427. *Porus cervinus*, Borlase's Nat. Hist. of Cornwall, p. 240, tab. 24, fig. 7. *Cellepora cervicornis*, Fleming's Brit. An., p. 532. Johnston's Brit. Zooph., p. 276. Bellamy's Nat. Hist of South Devon, p. 269.

**Hab.** On stones and rocks, from deep water, common, Polperro, Goran, Deadman Point.

This species, in its general appearance, resembles a stag's-horn. It is calcareous, and irregularly branched. The base

is short, stout, round, and frequently distorted into rounded protuberances. The branches are compressed, especially towards their terminations. Except the terminations of the branches, the whole of the surface is roughly granular, from the irregular growth of the cells. The cells are urceolate, partially imbedded, and distributed over all parts of the polypidom. The apertures are round, with a notch on the inferior margin and an obscure wave on the superior one. At the termination of the branches the surface is smooth; the apertures of the cells only appearing. The granular surface is produced by the super-position of cells on the plain first layer. When living, the polypidom is of a delicate flesh colour, which afterwards changes to a dusky brown; and it frequently has a varnished appearance. Borlase, in his Natural History of Cornwall has a characteristic figure of this species but the figure given by Dr. Johnston is so entirely unlike any specimen of the great number I have procured, that it seems to be a distinct species approaching to *Eschara*. In this opinion I am supported by several friends to whom I have submitted specimens for comparison with the Doctor's figure.

*C. LÆVIS*. Calcareous, dichotomously branched, cylindrical; cells urceolate, somewhat quincuncially arranged; apertures round, with a mucro on the outer lip.

*Cellepora lævis*, Fleming's Brit. An., p. 532. Johnston's Brit. Zooph., p. 277.

*Hab.* On stones, off the Deadman Point, common.

This calcareous coral attains occasionally the height of two inches, but it is more commonly met with about one. In a living state it is of a reddish flesh colour, or pink, which always fades in death, and sometimes becomes of a pearly

## LEPRALIA. Johnston.

**Generic Character:** Polypidom calcareous, or membranous, calcareous, adnate, crustaceous, spreading circularly, formed of a layer of urceolate cells in juxtaposition, and arranged in a quincunx; aperture terminal, often covered with an operculum. Polypes ascidian.

**L. PEDILOSTOMA.** Encrusting, calcareous; cells ovoid, alternate, frosted, with a stout spine on the upper surface; apertures terminal, round, unarmed. Pl. xxii., fig. 14.

**Hab.** On stones about one mile from the shore, common; Polperro. Goran. *Mr. Peach.* Falmouth.

This, with several of the following species, are here described for the first time. They have long lain by me, but as they could not be satisfactorily referred to any described species, they were omitted in the Report of the Cornwall Polytechnic Society, till their specific differences could be decided on. Having been supplied with a collection from various localities by my friend Mr. Peach, and having compared them with those in my own collection, they prove to be distinct; and the one now under consideration has been named *pedilostoma* by Mr. Hassal.

It is very commonly found encrusting the stones used by the crab-catchers in mooring their crab-pots, in patches varying from one quarter to one inch in diameter. The cells are oval, and horizontal, and their surfaces granular or frosted; on the lateral and upper portion is a short stout spine removed from the aperture about one fourth of the length of the cell. The spine is short, but has a spreading base, and is sometimes placed laterally and at others immediately in front. The apertures are round, unarmed, and terminal. It frequently happens that small circular orifices are scattered over the polypidom, in the inter-cellular spaces, as if a few cells had been abortive.

**L. PUSTULATA.** Encrusting, calcareous; cells ovoid, alternate, in radiating lines; apertures semi-circular, with a prominent rim. Pl. xxii., fig. 2.

**Hab.** On stones and shells. Polperro. Goran, *Mr. Peach.*

This species occurs in encrusting patches of about three fourths of an inch in diameter. It is calcareous, adnate, with oval cells alternately arranged in radiating lines. The aperture is semi-circular and prominent, or formed by a tubular rim. The proximal lip is either straight, or slightly arched into the cavity of the mouth, and near it is a conoidal tubercle, which lies immediately in front; and this is among the earliest portions that become solidified. With the exception of this tubercle, the surface, in old specimens, is nearly smooth; but in young ones it is minutely granular.



**L. NITIDA.** Encrusting; cells ovoid, in juxtaposition, with transverse calcareous bands reaching to the median line; apertures oval. Pl. xxii., fig. 3.

*Berenicea nitida*, Fleming's Brit. An., p. 533. *Lepralia nitida*, Johnston's Brit. Zooph., p. 277, pl. 34, fig. 7.

*Hab.* On stones and shells, not very rare. Polperro, Goran, Mr. Peach.

This pretty species rarely exceeds half-an-inch in diameter. It is encrusting, calcareous, and composed of urceolate cells, placed in juxtaposition. When living it is either of a yellowish flesh colour or intermediate to a silvery white; but when dead it is dull. The cells though closely approximated are not always arranged in the same order; sometimes they lie in radiating lines in an alternate manner, the centre, or body of one cell being opposite to the junction of two in the next row; at others in circles round one centre, and sometimes in an irregular alternate manner, or in no order at all. The surface of the cell is furrowed by from five to nine transverse calcareous bands; they are dentiform or conoidal, with their bases placed laterally and apices nearly meeting in the centre or median line; but as they do not actually meet, there is a longitudinal line of a plain semi-transparent appearance. The apertures are oval, inclining to a triangular form, armed with two long slender divaricated spines on the distal margin. These differ from the spinous appearances referred to by Dr. Johnston as being produced by the incipient formation of the next cells; they are long slender hair like appendages which stand prominently from the cells. They, are however rarely to be seen, but in the younger cells, for they are so delicate that the agitation of the sea alone is sufficient to destroy them, and hence they are never found in specimens dredged up, but only in those carefully collected and pre-

shortly tubular. The margin is surrounded by numerous long and slender bristles, which are very commonly destroyed on all but the distal rim, and very frequently are wholly destroyed, from being so brittle; they may however generally be noticed as fragmentary tubercles. This species approaches very closely to the *L. nitida* especially when the bristles are destroyed. It differs however from that species, in having the transverse bands so short as to extend only one-fourth of the diameter, in having the aperture circular and surrounded with bristles and having the cells contracted at each extremity.

**LEPRALIA COCCINEA.** Encrusting, calcareous; cells oval, rough, with a blunt process near the proximal lip of the aperture.

*Lepralia coccinea*, Johnston's Brit. Zooph., p. 278.

*Hab.* On rocks near low water mark. Talland sand bay; Combe Lansallos; Polperro; Goran; Falmouth; Mount's bay.

This generally occurs in circular encrusting patches of about one inch in diameter, but it sometimes covers a space of an inch and three-quarters. It somewhat varies in colour according to the locality in which it grows; it is most commonly of a yellowish brown, or brownish flesh colour, fading occasionally to a white. The cells are oval, and arranged in circular rows. Their surface is rough, granular or frosted, which is more apparent in dried than in living specimens. The aperture is oval, plain, with a denticle near the proximal margin. As the cells lie on the crust in close approximation and the apertures and denticles give it a waved appearance, the surface being granular, the line of demarcation between the cells is very obscure, hence the whole seems indistinct and confused.

**L. TRIDENTATA.** Encrusting, calcareous; cells oval, horizontal, rough; apertures oval, with a triangular denticle on the proximal, and one on each of the lateral rims. Pl. xxii. fig. 5.

*Hab.* On rocks, stones, &c., from deep water to low water mark. Common.

This calcareous and encrusting species varies from one quarter to one inch in diameter. In living specimens it is generally of a yellowish red colour inclining to a purple, but it is sometimes of a delicate flesh colour, all of which slightly fade in death. The cells are oval, horizontal, and closely arranged in circular rows; they are rather indistinct at first sight from their frosted surfaces, their irregularity or waved appearance about the apertures, and their being somewhat

imbedded. The surface is frosted or minutely punctured. The apertures are oval, and armed with three triangular denticles, which slightly lean over the opening; at the distal margin there are three or four long slender bristles, which readily break off. In the newer portions these bristles are nearly always to be found, and the mouth is terminal and almost hid from view by the teeth and prominent character of the surrounding parts.

This most nearly approaches the *L. coccinea* in character, but differs so much as to show a specific difference.

**L. VARIOLOSA.** Encrusting, calcareous; cells oval, alternate, or semi-alternate, punctured or frosted; separated from each other by a raised line. Pl. xxii., 6.

*Lepralia variolosa*, Johnston's Brit. Zooph., p. 278, pl. 34, fig. 4.

**Hab.** On shells and stones, not uncommon. Polperro, Goran, *Mr. Peach*.

Encrusting; the crust is very closely adherent, circumscribed, and calcareous. It is of a yellowish flesh colour while living, which in death changes to a sallow white, or yellowish brown, but is very frequently of a pure white. The cells are oval, somewhat imbedded, long and slightly inflated; their surfaces are minutely punctured or frosted. They are separated from each other by a raised intercellular ridge, which is marked by large depressions. The apertures are round, but are liable to a little irregularity on the proximal lip; and on the distal margin are two long slender diverging spines, which in dried specimens, are most commonly destroyed.

**L. VINCA.** Calcareous, encrusting; cells ovoid, apertures round, armed with three or more spines; the fissures

**L. FENESTRALIS.** Encrusting, calcareous; cells urceolate, slightly immersed, semi-erect, and reticulated; aperture contracted, circular, with a slight tooth on the proximal lip. Pl. xxii., fig. 8.

*Hab.* On stones at short distances from the shore, not uncommon.

This rarely exceeds three fourths of an inch in diameter; it is calcareous and encrusting. The cells are urceolate and closely arranged in circular rows; they do not, like most other species, lie horizontal to the crust, but the oral portions are elevated, or semi-erect. The surface of the cells is rough; several calcareous lines run longitudinally their whole length, and these are crossed nearly at right angles by shorter bands, which give the surface a network appearance with square meshes. This window-like surface, has the interspaces filled with a transparent membrane, which is more apparent in dried, than in living specimens. The aperture is small, contracted, and circular, with an irregularity on the proximal lip.

**L. RETICULATA.** Encrusting, calcareous; cells urceolate, reticulated; apertures semi-circular. Pl. xxii., fig. 9.

*Hab.* On stones &c., not uncommon. Polperro, Llanillos bay; Goran, *Mr. Peach*.

This species encrusts the surfaces of stones, about low water mark, in patches varying to an inch and half in diameter. The cells are urceolate and nearly horizontal and, though not heaped together, have no constant order of arrangement. The cells are rough. From the aperture down the centre of the cell lines diverge obliquely downwards and outwards to the sides of the cells; these are again crossed by lines in an irregular manner; hence the surface has a reticulated appearance. The interspaces or depressions formed by these lines are translucent. The lines, however, are not alike in all the cells; but there is always an approach to the above description, which may therefore be taken as a type of the whole. The apertures are semi-circular or half-moon shaped, large, with a raised rim, which is most apparent in dried specimens.

This differs from *L. fenestralis* in several particulars; the cells are larger and more horizontal; the reticulations of no regular form, being sometimes square and at others rhomboidal. The lines forming the reticulations diverge from a median line, instead of running longitudinally as in *L. fenestralis*; in this the aperture is large and semi-circular, in the other contracted and round.

**L. CILIATA.** Encrusting; cells inflated, slightly rough; apertures round, contracted, armed with about six bristles on the distal and lateral margins. Pl. xxii., fig. 10.

*Berenicea utriculata*, Fleming's Brit. An., p. 533. *Lepralia ciliata*, Johnston's Brit. Zooph., p. 279, pl. 34, fig. 6.

*Hab.* On stones and shells, from near low water mark to deep water. Whitsand bay, Polperro, Goran, &c.

This species is membrano-calcareous, encrusting, thin, white, and spreading in a circular manner from about one inch to one and half inch in diameter. The cells are distant, or not in contact, ovato-globose and semi-erect. The apertures are terminal, contracted and armed with from five to seven teeth or spines on the distal and lateral margins. These spines from their brittleness, are commonly destroyed in preserved specimens, and most have but their mutilated remains.

**L. TRISPINOSA.** Encrusting; cells oval, closely arranged; surface roughish; apertures terminal, armed with three long conoidal spines on the distal margins.

*Lepralia Trispinosa*, Johnston's Brit. Zooph., p. 280, pl. 34, fig. 5.

*Hab.* On stones and shells from deep water, rare. Polperro.

Encrusting, thin membrano-calcareous, and white but freckled with yellow. The cells are elongated and oval, and horizontal and radiating. The apertures are raised, ovoid, with a notch on the proximal, and armed with three long conical spines on the distal lip.

**L. IMMERSA.** Encrusting; cells oval, immersed; apertures oval, with a tooth on the proximal and from five to seven spines on the distal lip.



of alternating approximated cells; cells oval, horizontal, membranous; the apertures patulous, with hard calcareous rims. Polypes ascidian.

**HAIRY SEA-MAT.** *M. Pilosa*. Aperture of the cells oval, armed with horizontal teeth pointing towards the centre, and with one long bristle on the proximal margin.

*Flustra pilosa*, Ellis and Solander's *Zooph.*, p. 13. Irregular spongy foliaceous coralline, Ellis' *Coral.*, p. 73, pl. 31. *F. pilosa*, Turton's *Lin.*, vol. 4, p. 663. Stewart's *Elem.*, vol. 2, p. 436. Fleming's *Brit. An.*, p. 537. Templeton in *Mag. Nat. Hist.*, vol. 9, p. 469. Johnston's *Brit. Zooph.*, p. 280, pl. 34.

There is a variety of this species, in which the long bristle is either not formed, or destroyed, and is described by the following authors as a distinct species.

Ellis *Coral.*, pl. 29, fig. D. *Flustra dentata*, Ellis and Solander's *Zooph.*, p. 15. Turton's *Lin.*, vol. 4, p. 664. Stewart's *Elem.*, vol. 2, p. 436. Templeton in *Mag. Nat. Hist.*, vol. 9, p. 469.

*Hab.* On stones, shells, and especially fuci about low water mark; abundant.

This is found under a great variety of appearances, depending on the nature and form of the substance on which it grows. It is encrusting; the cells are oval, slightly tubular, membrano-calcareous with thickened rims. The apertures which are oval, are guarded by horizontal teeth pointing towards the centre. In the most perfect specimens, there is a long slender bristle on the proximal lip; this however is sometimes absent, but there is generally a sufficient remnant to show its previous existence. As it grows on the minute fuci about low water mark, the cells are frequently invisible from the length and prominency of these bristles; hence the polypidoms look very hairy. The absence of the bristle is generally found in specimens which grow on the fronds of the larger fuci. This has given rise to the supposition that there are two species; but there are generally sufficient traces left behind to prove their destruction. As the larger sea-weeds are liable to continued, and frequently violent motion, the delicate and friable appendages are easily destroyed; whereas on the smaller fuci, which are stiff and allow of but of little motion, these parts are generally in a state of perfection. Specimens are sometimes found which are very dissimilar in appearance, and in fact look like distinct species, but after examining numerous specimens, no distinctive differences can be detected between them, and gradations can be traced into each other, so that for the present they must be considered as one species.

It is generally encrusting, but sometimes it rises into frond-like prolongations, with a layer of cells on either side, separated from each other by a central cavity; the sides however are generally in contact, and afford each other mutual support.

**M. UNICORNIS.** Encrusting, calcareous; cells oval, with a short stout spine on the lateral or distal rim.

*Flustra unicornis*, Fleming's Brit. An., p. 536.

*Hab.* On stones, not uncommon. Polperro. Goran, &c.

This encrusting calcareous species occurs in patches of about three-fourths of an inch in diameter. The cells are oval, with stout calcareous rims, and are arranged in circular rows. The margins of the oral apertures, are embossed and marked with three or four circular orifices. The apertures are circular and armed with a stout spine on the distal or lateral margins.

**M. PEACHII.** Encrusting; cells radiating; apertures oval, unarmed, with two punctures at each extremity.

*Flustra Peachii*, 9th Report of the Cornwall Polytechnic Society, p. 81.

*Hab.* On dead muscle and oyster shells in the Falmouth and Fowey rivers; off the Deadman point; common.

Encrusting, membrano-calcareous; cells ovoid, having their longest diameter in the axis of growth, and at each extremity two minute punctures; the apertures even and unarmed. The cells which have a radiating distribution, appear somewhat confused from their radiating from so many points and intermingling with each other.

This species was first found by Mr. Peach in the Fowey river; since then in company with him I have found it

## FLUSTRA. Linnæus.

**Generic Character:** Polypidom plant-like, membranaceous, flexile, frondose, or crustaceous; formed of cells arranged quincuncially, in several series, in one or two layers; cells in juxta-position, more or less quadrangular, flat, with distinct borders; the apertures transverse, semi-lunar, valvular, subterminal.

\* *Foliaceous, cells on both sides.*

**BROAD LEAVED SEA-MAT.** *F. Foliacea.* Flat, branched; branches palmate, truncated; cells in longitudinal rows, alternate, arched at the distal, narrow at the proximal extremity, armed with four or five marginal denticles.

*Fucus telam lineam sericeamve textura sua æmulans*, Raii Synop., p. 42. *Flustra foliacea*, Ellis and Solander's Zooph., p. 12, pl. 2, fig. 8. Broad leaved Horn Wrack, Ellis' Cor., p. 70, pl. 29, no. 2, figs. a A, C, *Flustra foliacea*, Turton's Lin., vol. 4, p. 663; Templeton in Mag. Nat. Hist., vol. 9, p. 469. Fleming's Brit. An., p. 535. Johnston's Brit. Zooph., p. 283, figs. 1, 2. Stewart's Elem., vol. 2, p. 435.

**Hab.** On stones from deep water. Whitsand, Tolland-sand, and Mevagissey bays, Goran; common, frequently washed on shore.

This species grows to the height of four inches, in flat, palmated tufts, and is one of the most elegant of all the sea mats; when living it is of a lively flesh colour, which, in death, turns to a dusky white. At the base, it is rounded and narrow, but soon gets expanded and flat as it ascends. The branches are broadly palmate and truncated. Cells on both sides, from the base to the apex, contracted below, above rounded and dilated, with two pair of teeth on the external rim, which are shorter than the diameter of the cell. It frequently emits an odour resembling that of violets after a shower.

**PAPER SEA-MAT.** *F. Chartacea.* Cells quadrangular, bulging about the middle; apertures unarmed.

Ellis' Coral., p. 38, figs. 8, o. p. *Flustra papyracea*, Ellis and Solander's Zooph., p. 13. Fleming's Brit. An., p. 535, no. 140. *F. chartacea*, Turton's Lin., vol. 4, p. 663. Stewart's Elem., vol. 2, p. 436. Johnston's Brit. Zooph., p. 284.

**Hab.** On a shell from deep water, eight leagues south of the Deadman; very rare.



This delicate species grows to the height of one third of an inch, and is of a light straw colour; the cells are on both sides, running from the base to the apex, are quadrangular in form, but enlarged about the centres. It is dichotomously branched, and the terminations of the branches are axe-shaped, or truncated.

Fleming seems to be in doubt, whether to consider this as a distinct species, or a variety of the preceding; he founds his doubts on a specimen sent him by Montagu; but the specimens I have seen do not countenance such a doubt. It much more resembles the *Flustra truncata*; from which there appears to be no sure mark of distinction.

\* \* *Foliaceous, with cells on one side only.*

**FAN SHAPED SEA-MAT.** *F. Avicularis.* Cells quadrangular, in three or four rows, with a spine at each distal angle on the external edge, and one on each side below, pointing across the cells.

Ellis' Coral., pl. 38, fig. 7. *Flustra avicularis*, Fleming's Brit. An., p. 536, no. 144. *Crisia flustroides*, Lamouroux's Cor. Flex., p. 141. Johnston's Brit. Zooph., p. 286, pl. 36, figs. 3, 4.

*Hab.* On stones, shells, especially the *Pinna ingens* and *Pecten maximus*, on the back of the larger spider crabs, from deep water; common.

This very beautiful and delicate species varies in height to one inch, it is however sometimes so small as not to exceed one fifth of an inch; when living it is of a very delicate flesh colour, but in dying it changes to a dull brown.

The polypidom is compressed, thin and divided dichotomously into flat segments which terminate in a truncated manner; when living it is very elastic, but when dead it is

creature is at present unknown. The similarity between the cells of this species and the *Cellularia avicularia* is so very great, that many naturalists have considered them the young and adult state of the same species; and for this, or some other reason, Dr. Fleming in his "British Animals" ranks them as one; he refers his *F. avicularis* to the *Crisia avicularia* and *C. Austroides* of Lamouroux; and the *Sertularia avicularia* of Linnæus; this cannot now however, be maintained. As the cells in *C. avicularia* are only in two alternate rows, while the *Flustra avicularis* has about four or five, the *cellularia* is supposed to be the youngest state. In answer to this, it may be observed, that the *Flustra avicularis* has been obtained only one fourth of an inch in height, yet having the four and five rows of cells; while the *Cellularia avicularia* has not been found so small, but almost always higher than the *Flustra*, and sometimes one third as high again with only two rows of cells; and they have not yet been found in company with each other. In addition to this, the *Flustra* is common, while the other is comparatively rare; and in death the *Flustra* changes to a brown, while the other fades to a dull white; so that there can be no doubt of their being distinct. This opinion is also entertained by Johnston, Milne Edwards, and Mr. Bean.

\* \* \* Crustaceous

**CHAGRIN SEA-MAT.** *F. Membranacea*. Encrusting; cells quadrangular, alternate, with a blunt spine at each angle.

*Flustra membranacea*, Ellis and Solander's Zooph., p. 18, no. 12. Turton's Lin., vol. 4, p. 665. Fleming's Brit. An., p. 536. Stewart's Elem., vol. 2, p. 437. Johnston's Brit. Zooph., p. 287, pl. 38, fig. 1, 2, 3.

*Hab.* On sea weed, (*Laminaria digitata*) every where common. Pl. xxi.

This abundant species, encrusts the broad fronds of the larger sea weed, in spots varying from a mere speck to two or three feet in length. It has a very delicate and gauze-like appearance, and while lying exposed on the shore looks more like a thin saline incrustation, than a living being. On examination even with the naked eye, it will be found to be composed of quadrangular cells, with a blunt horn on each angle. The longest diameter of the cell is in the axis of growth, and the rims only are calcareously white; the other portions being white and translucent. On the upper or distal part of the cell, and but a very short distance from the two spines, is a small semi-lunar opening, convex above and

concave below, through which the polype protrudes. The cells are arranged in alternate rows, and are about three times as long as they are wide. About December, January, and February, numerous yellow semi-translucent sacs protrude irregularly from all parts of the surface, which are filled with a gelatinous fluid, which afterwards becomes granular. On examination they appear to rise from the sides of the cells, and make their external appearance through the polype mouths, and finally grow to nearly twice the length of the cells. The production of these sacs, is the destruction of the polypes of the cells in which they grow. The polype is active, with twelve ciliated tentacula in a single circle.

**F. LINEATA.** Encrusting; cells oval, radiating from a centre; apertures armed with numerous horizontal teeth pointing towards the centre.

*Flustra lineata*, Turton's Lin., vol. 4, p. 665. Johnston's Brit. Zooph., p. 288, pl. 28, fig. 4.

*Hab.* On stones in pools between tide marks, common. Polperro. Whitsand bay. Goran. Fowey, &c.

This encrusting species, appears to be enveloped in doubt and obscurity. It occurs in patches of about one inch diameter, but most frequently about one half or three-fourths of an inch. The cells are oval, in juxtaposition and very small. The apertures are armed with numerous slight horizontal teeth which meet about the centre; sometimes the teeth on one side are very greatly developed, while those of the other are nearly abortive; but in all cases from the presence of these teeth, the cells are hardly to be distinguished by the naked eye. On the distal margin are two long diverging spines.

**F. CARNOSA.** Encrusting; fleshy, with imbedded remote cells; apertures contracted and armed.

*Flustra hispida*, Fleming's Brit. An., p. 537. *Flustra carnosa*, Johnston's Brit. Zooph., p. 288, pl. 37, fig. 5.

*Hab.* On Fuci, common.

It is a thick, fleshy encrusting species, of a light brown or cream colour. The cells are imbedded, distant from each other, with contracted wrinkled apertures of a half-moon-shape, and three or four erect spinous teeth.

**F. TUBERCULATA.** Encrusting, calcareous, thin; cells oval, with a tubercle on the distal, and one on each lateral margin.

*Flustra tuberculata*, Johnston's Brit. Zooph., p. 289, pl. 34, fig. 9.

*Hab.* On stones a few miles from the shore. Polperro. Goran. Mount's bay.

This is not a rare species, but is to be found encrusting stones at short distances from the shore, from the entrance of Plymouth sound to Falmouth harbour and Mount's bay. In a living state it is so much unlike the figures and descriptions given of it, that at one time I considered it a new species, and it was by an examination of the dried specimens only that the mistake was discovered. In a living state, its encrusting character resembles the *Flustra membranacea*, being thin and gauze-like; but it encrusts stones instead of sea weed. It is most commonly found in circumscribed patches varying from a quarter to one inch in diameter. The cells are alternate with stout calcareous rims, and are oval, inclining to a quadrangular or lozenge-shape. At each angle is a large stout tubercle, without any spine or process. It is of a deep flesh red colour. As the cells are alternate, with a tubercle on the distal margin, each appears to be surrounded with four, which slightly encroach on the quadrangular diameter. These tubercles are always of a brighter colour than any other part.

When the specimen is dried, this appearance is considerably altered; the quadrangular shape of the cells is changed into an oval; the tubercle on the distal margin appears to be considerably above the cell and to stand on a hollow dome; and on each side is a curved process. This species assumes a great variety of forms, from the appearance of this tubercle. In old specimens it is so much injured, and sometimes so entirely destroyed, that it is difficult to recognize it; in these states Dr. Johnston's figures represent it.

## CELLULARIA.

**Generic Character:** Polypidom calcareous or membrano-calcareous, confervoid, divided sub-dichotomously, the divisions narrow, composed of two alternating series of oblong sessile cells on a single plane; the apertures terminal, oblique, facing one way and usually covered with an operculum. Polypes ascidian.

**CILIATED CORALLINE.** *C. Ciliata.* White, erect, dichotomously branched; cells distinctly alternate, all opening on one side; apertures oblique, with four or five long bristles on the upper and outer margins. Pl. xxiii., fig. 1.

Ciliated Coralline, Ellis' Coral., p. 38, pl. 20, fig. d D. Sertularia ciliata, Turton's Lin., vol. 4, p. 685. Stewart's Elem., vol. 2, p. 448. Cellularia ciliata, Flem. Brit. An., p. 540. Cellaria ciliata, Ellis and Solander's Zooph., p. 24, no. 6. Crisia ciliata, Lamouroux's Cor. Flex., p. 139. Templeton in Mag. Nat. Hist., vol. 9, p. 468. Cellularia ciliata, Johnston's Brit. Zooph., p. 290, pl. 38, fig. 1 and 2.

**Hab.** On Corallines and sponges, near the Eddystone lighthouse; not common. Mount's bay.

This minute and delicate species grows in down-like tufts to the height of half-an-inch. It is white, calcareous, and dichotomously branched. The cells are distinctly alternate, narrow at the base, and enlarged above; the apertures are all turned on one side, and are very large, oblique, with four or five hollow spines, which, when perfect, are about four times as long as the diameter of the cell; these are situated at the upper and outer labial rim. Over the apertures are helmet-shaped pearly lids, which are raised in drying.

**CREeping STONY CORALLINE.** *C. Scruposa.* Creep-



This, compared with the last is a stout species. It is abundantly found towards autumn among the matted roots of the larger *fuci*; in these situations it grows in great profusion so as to fill up every crevice. It is calcareous, white, and sometimes tinged with red, and rarely exceeds one inch in height, being more inclined to spread than rise. As it thus trails along, many of the branches come in contact with the substance on which it grows, from these points long slender tendrils arise, which firmly clasp the *fuci* and secure the polypidom in its situation. The cells are in the branches and do not stand prominently out as in the last species; they are alternate, and open by oval oblique apertures which have a stout blunt spine on the upper and outer rim. The apertures all face on one plane, and the lower portion of one orifice is immediately above the upper margin of another.

**CREEPING CORALLINE.** *C. Reptans.* Calcareous, creeping, dichotomously branched; cells semi-alternate, with oblique apertures, armed with four or five spines at their outer rims. Pl. xxiii., fig. 3.

Creeping Coralline, Ellis' Coral., p. 37, pl. 20, fig. b B. Sertularia reptans, Turton's Lin., vol. 4, p. 685. Stewart's Elem., vol. 2, p. 448. Cellularia reptans, Fleming's Brit. An., p. 540. Johnston's Brit. Zooph., p. 291, pl. 38, figs. 3 and 4. Bellamy's South Devon, p. 270. Crisia reptans, Templeton in Mag. Nat. Hist., vol. 9, p. 469. Lamouroux's Cor. Flex., p. 140.

*Hab.* On the roots of the larger *fuci*, every where common.

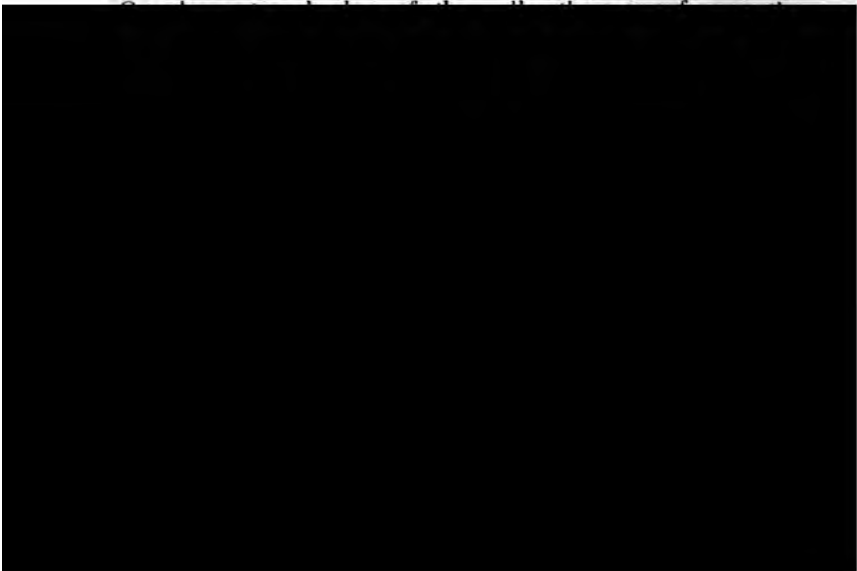
This species is very similar to the last in its habits and spreading character. It is calcareous, spreading and grows to the height of about three quarters of an inch. It is dichotomously branched; and the branches are linear and diverging. The cells are biserial, alternate, and very loosely arranged; the apertures are oval, oblique, divergent, and have at their superior and external rim several long tubular spines. These spines, however are much shorter than those of *C. ciliata*, rarely exceeding in length the diameter of the cell. The number of these appendages varies in different specimens; Ellis has figured it as having only two, a number I have also seen, but they most commonly amount to three or four and very rarely indeed to five; but whether two, three or four, the same number generally pervades the whole specimen. At the joints, where they come in contact with the substance on which the polypidom grows, a few slender tendrils arise, with hooks, by which the animal is firmly rooted.

**BIRD'S-HEAD CORALLINE.** *C. Avicularia.* Calcareous, erect, dichotomously branched; cells glandular, opening on one plane, with an erect spine at each superior angle, and the rudiments of two others below, crossing the diameter.

Bird's-head Coralline, Ellis's Coral., p. 36, pl. 20, fig. a. A. *Sertularia avicularia*, Turton's Lin., vol. 4, p. 685. Stewart's Elem., vol. 2, p. 448. *Cellaria avicularia*, Ellis and Solander's Zooph., p. 22. *Crisia avicularia*, Lamouroux's Cor. Flex., p. 141. Templeton in Mag. Nat. Hist., vol. 9, p. 468. *Cellularia avicularia*, Johnston's Brit. Zooph., p. 292, pl. 36, fig. 78.

*Hab.* On the back of the Corwich crab; at low water mark. Mevagissey bay. Mount's bay.

This beautiful and delicate coralline is by no means common; compared with the others of this genus, it is more bushy, erect, and graceful. It is calcareous, erect, dichotomously branched, and varies in height from one inch, to one and three quarters. When living it is very elastic and of a delicate flesh colour; but when dead, it is white and brittle. It is rooted by matted tubular fibres, and it arises by a small round stem, which soon begins to divide and branch. The branches are formed of two rows of alternating cells which open on one plane. The cells are quadrangular and have a spine at each superior angle which point upwards; below these are two others, one on each side, which cross the diameter of the cell; these last are sometimes absent or in so rudimentary a state as scarcely to be noted. The apertures, like those of *Flustra*, are subterminal and transverse, and are covered with pearly shield-like opercula, which become elevated between the superior spines in dying.



*fastigiata*, Blumenbach's Man., p. 273. Fleming's Brit. An., p. 539. *Cellaria plumosa*, Ellis and Solander's Zooph., p. 21. *Crisia fastigiata*, Templeton in Mag. Nat. Hist., vol. 9, p. 468. *Acamarchis plumosa*, Johnston's Brit. Zooph., p. 294, pl. 39.

*Hab.* At short distances from the shore, on rocky ground. Polperro, rare. Falmouth, Miss Warren.

This confervoid species attains the height of four inches, but is more commonly found about two and half or three. It is calcareous, of a delicate flesh colour, fading in death to white, and is dichotomously branched. The branches are slender, and composed of two rows of alternating cells, all opening on the same surface. The cells are oblong, diaphanous, like porcelain, polished, with a spine on the upper and outer angle. The ovaries are pear-shaped and situated over the apertures. This species is liable to so much disfiguration that it is not easy at all times to detect it. I have procured many specimens in such a state that it was found impossible to decide on their specific characters; and it was not till the examination of a tolerably perfect specimen shown me by Miss Warren, of Flushing, that the specific characters were identified. In old specimens the cells become obsolete and the branches deformed and stunted.

Dr. Johnston has arranged it as *Acamarchis* instead of *Cellularia*, but as the characters have a great degree of sameness in description as well as figure it is here united with *Cellularia*. To the experienced naturalist, however, there will appear characters which approach to *Flustra*, but not more so than in *C. avicularia*, and both are here united in one genus.

#### FARCIMIA.

*Generic Character:* Polypidom rooted, plant-like, calcareous, dichotomous; the branches cylindrical, regularly jointed, with immersed rhomboidal cells diverging from the axis, disposed in quincunx, and opening on the surface; the apertures lateral, plain, non-operculate.

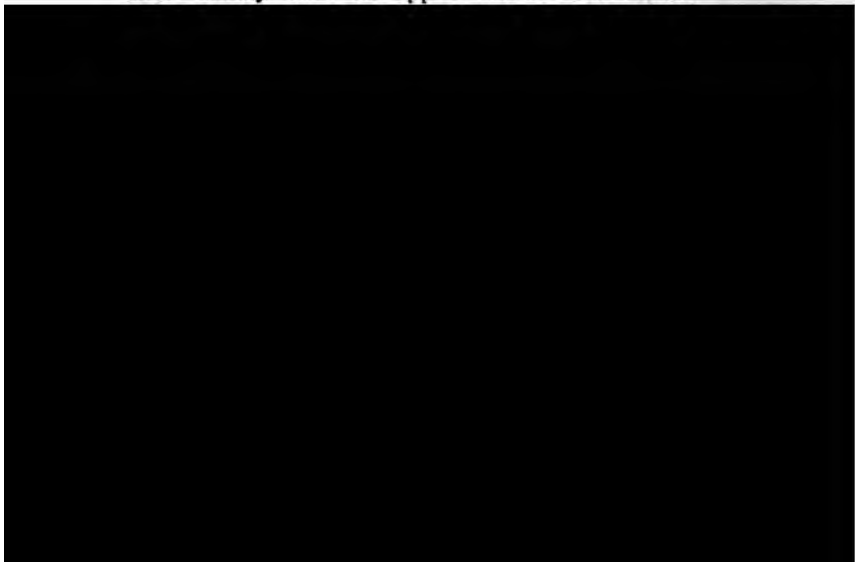
**FARCIMIA SALICORNIA.** Branches composed of one cylindrical articulation, jointed only at their origins and terminations; surrounded with lozenge shaped cells. Pl. xx., fig. 3.

*Corallina fistulosa fragilis*, Raii, Hist., vol. 1, p. 65. Bugle *Coralline*, Ellis' Coral., p. 46, pl. 23. *Tubularia fistulosa*, Turton's Lin., vol. 4, p. 666. Stewart's Elem., vol. 2, p. 438. *Cellularia farciminoides*, Ellis and Solander's Zooph., p. 26. *Farcimia fistulosa*, Fleming's Brit. An., p. 534. *Salicornia fistulosa*, Templeton in Mag. Nat. Hist., vol. 9, p. 469.



*Hab.* On stones and shells from Eddystone Lighthouse to the Lizard and Land's-end, common.

This elegant and beautiful species varies in height from one to six inches, and is readily recognized from having no British species like it. It is arborescent and dichotomously branched; the branches are cylindrical and contracted at their terminations, and two ramifications arise from each joint. The cells are numerous, rhomboidal in shape, plain, quincuncially arranged on all parts of the branches. It is rooted by tubular fibres, and the branches are erecto-patent, and from the contracted terminations of the internodes being said to resemble sausages it derives its generic name *Farcimia*. A good deal of difference occurs in the size of the polypidom, and the shape and distribution of the cells, in different specimens. In some now before me, the branches are three fourths of an inch in length and very stout, about a line in transverse diameter; in others the branches are about one fourth of an inch long and about as stout as an ordinary sewing needle, and some are fusiform and others are club-shaped. The cells also are liable to considerable variations, not only in different specimens, but in different parts of the same. Thus those cells at the inferior portion of the branches are quadrangular most commonly, while at the upper parts the superior angle is expanded into an arch, and hence resembles the cells of *Flustra foliacea*. It would almost seem as if there were two species confounded under this name; but although they differ so much in size I have been unable to discover any specific distinctions between them. The cells can offer no guide in determining this point as they vary so much in the same specimen. This is a very elegant species both as it regards its arborescent form, and the delicately embossed appearance of its branches.



from Sark, so that, though rare it will probably be found throughout the English channel.

ESCHARA. Ray.

**Generic Character:** Polypidom membrano-calcareous; inflexible, brittle, expanding in the form of foliaceous porous lamellæ, variously folded and anastomosing, and consisting of two layers of opposite cells: cells immersed, coalescent, horizontal to the plane of axis; opening on both surfaces in quincuncial pores protected with an operculum. Polypes ascidian.

**STONY FOLIACEOUS CORALLINE.** *E. Foliacea.*

Membrano-calcareous, in thin waved plates like the borders of a lady's cap; plates frequently uniting; cells on both sides of the folds.

Stony Foliaceous Coralline, Ellis' Coral., p. 71, no. 3, pl. 30, fig. a A B C. Borlase, p. 239, pl. 24, fig. 6. *Eschara retiformis*, Raii, Synop., vol. 1, p. 31. Fleming's Brit. An., p. 531. *Millepora foliacea*, Ellis and Solander's Zooph., p. 133. Turton's Lin., vol. 4, p. 636. *Millepora fascialis*, Stewart's Elem., vol. 2, p. 427. *Eschara foliacea*, Johnston's Brit. Zooph., p. 297, pl. 40.


**Hab.** About two miles N. N. W. of the Eddystone, very common. Off the Deadman point occasionally; mid-channel, common. Falmouth bay, *Miss Vigurs*.

This is the largest of all the Cornish, and probably of the British corals. Dr. Johnston says it "attains a large size being often three or four inches high and from twelve to twenty in its greatest diameter." But this, even, is small compared with many specimens procured on the Cornish coast; the largest I ever saw was hooked up by a fisherman off the Eddystone in the Autumn of 1843, it measured seven feet four inches in circumference, and a foot and three quarters in depth. It is, however, most commonly found in a much humbler form. When living it is of a delicate flesh colour which turns to a light brown in death. It is a very thin and foliaceous species, resembling a sheet of paper waved into various folds. The plaits or folds frequently unite and form cavernous passages through the mass. The cells are small, and arranged on both surfaces of the sheet; on the older portions they are recognized by the small round apertures quincuncially arranged: the surfaces being made even by calcareous deposit. When living it is slightly elastic, but when dead it is exceedingly brittle; breaking on the least touch. Beside this foliaceous or plaited form, there is another, not noticed by authors; an encrusting form which resembles the *Flustra bullata* of Linnæus. This is found

encrusting stones and forming its cells like a *Flustra*, in large circumscribed patches. The first appearance of its rising into a lamellated form, is the production of detached ridges and papillary eminences, as these become more elevated they assume the form described above.

The growth of the cells appear to be periodic and rapid; formed, in the first place very delicately, and afterwards completed and strengthened by depositions of calcareous matter. In almost every specimen, bands of this periodic growth are to be seen varying from half-an-inch to one inch in depth. If these bands be carefully examined it will be found, that all the cells composing them are nearly in the same condition of growth; each band differing from the other. Hence the polypidom is frequently marked by ridges, which indicate the extent of the various enlargements; and the whole process of the growth of the cells, from the mere gelatinous effusion, to the complete obliteration, can be observed in a single specimen.

The form of the cells varies with the form of the polypidom, yet every change can be considered but as variations of one form from mechanical causes. When the extension takes place in the *encrusting* form, the effusion of the pulp is more extensive than in the erect and foliaceous state. In this, lime is rapidly deposited and the cells appear larger and not so much crowded as in the other kind, so that the growth is effected here as it is in *Lepralia*, *Flustra*, &c. The cells, which are superficial and on both sides of the leaf when erect, stand on a solid base which unites both surfaces. They present three varieties of appearance the first of which is the semi-gelatinous or pulpy state, the second where the surface is granular, from the fully developed cells, and the third is the confused appearance produced by the partial



Cor., p. 87, no. 5, pl. 32, fig. d D. Alcyonium gelatinosum, Ellis and Solander's Zooph., p. 176. Turton's Lin., vol. 4, p. 653. Fleming's Brit. An., p. 517. Lamouroux's Cor. Flex., p. 350. Stewart's Elem., vol. 2, p. 432. Johnston's Brit. Zooph., p. 300, pl. 41, figs. 1—3.

*Hab.* On shells and stones from deep water; not rare on the south and south-west coast.

This species varies in height to sixteen inches, and is said sometimes to grow as high as "several feet;" in its texture it is spongy or fleshy, semi-opaque, dotted, and of an amber colour, varying from the light yellow, to the brown tint; the surface is even, smooth, polished, lobulated, and dotted; the polypes lie beneath the surface in the substance of the polypidom, with which they are very intimately connected. The tentacula, though of very unequal length, are long, ciliated, capable of being folded up, and so withdrawn into the cell; in the earliest state of growth, it is a simple incrustation, but soon assumes a finger-like prolongation, from which lobes afterwards sprout on all sides.

This was considered a vegetable by the older botanists; Ray thought it a *Fucus*; Ellis appears to be among the first to have discovered its true character.

**A. HIRSUTUM.** Polypidom fleshy, simple or lobed, compressed, surface granular.

*A. hirsutum*, Fleming's Brit. An., p. 517. Johnston's Brit. Zooph., p. 303, pl. 42, figs. 1, 2.

*Hab.* On *fuci* about low water mark, and on a *Pinna ingens* from deep water. Polperro, Tallandsand bay, Mevagissey bay.

All the specimens of this species which I have found in the Cornish seas, were long, slender, very much compressed, semi-transparent, and fleshy, with a slightly granular surface, clouded with brown, and marked with black specks; but it is said to be sometimes sub-cylindrical and palmate. It is soft and flexible. Its structure is cellular, the cells delicate and compactly arranged. The granulations of the surface are formed by minute conoidal papillæ, which are closely crowded together. The tentacula vary in number from sixteen to eighteen.

**A. SUBVIRIDE.** *R. Q. C.* Massive, lobulated, of a brownish green colour; surface irregular, covered with small pores, interspersed with larger ones of very irregular shape.

*Hab.* From deep water, off the Deadman point.

When recent and living, it is generally of a greenish orange, but is sometimes of an olive brown or green colour,

with a shining polished surface; it is filled with a gelatinous slime and covered with minute punctures. The polype orifices are large, distant, and of very irregular shape. The polypes, though seen, in consequence of other engagements were not examined till they had become too much injured for description. It varies in height to ten inches, and in thickness to six. This I have failed to identify with any species described by the authors to whom I have access, and in fact is now held to be new.

**A. ECHINATUM.** Encrusting, thin; surface granular when living, roughened with papillæ when dead.

*A. echinatum*, Fleming's Brit. An., p. 517. Johnston's Brit. Zooph., p. 304, pl. 42., fig. 3, 4.

*Hab.* On dead specimens of the *Buccinum undatum*, and other dead univalve shells; common. Polperro, Mevagissey, Goran, and Whitsand bay.

This species is invariably found encrusting dead univalve shells, it is very thin, and of a brown colour. When living it is fleshy, slightly diaphanous, and the mouths of the cells are but slightly prominent; when dry, it becomes hard, shrivelled, and the apertures of the cells prominent and stiff. The points or prickles, which are distributed over the surface, have no permanent regularity, sometimes being arranged in rows, as Dr. Johnston has figured them, and at others distributed in a very irregular manner.

Montagu first discovered it as a zoophyte, on the Devonshire coast, and communicated it to Fleming; he says the polypes have twelve tentacula.

**A. PARASITICUM.** Parasitical on corallines, arenaceous; cells distant, round, or substance porous.

*A. parasiticum*, Fleming's Brit. An., p. 517. Johnston's



an *annulated* animal, rather than that of a zoophyte, though I have not succeeded in detecting it.

#### LIMNIADES.

Polypidoms fleshy, or spongy, or corneous, polymorphous; the polypes placed in tubes with angular or round orifices, closed when the animals recede.

#### FREDERICELLA.

**Generic Character:** Polypidom fixed, coriaceous, tubular, branched. Polypes issuing from the extremities of the branches; tentacular disc orbicular, tentacula arranged on the margin of the disc in a single series, about twenty four in number, invested at their origin by a membrane. Dr. Allman, Ann. and Mag. Nat. Hist., vol. 13, p. 331.

**FREDERICELLA SULTANA.** Horny, trailing, sparingly branched; branches tubular, closed at their terminations when the polype is withdrawn.

*Plumatella sultana*, Johnston's Brit. Zooph., p. 323.

**Hab.** On the weeds in the ponds at Trengwainton, near Penzance; common.

This species till very lately, was arranged with *Plumatella*, but that genus is now divided into two, *Plumatella*, and *Fredericella* by Allman and others.

It is horny, tubular, creeping, and rarely exceeds an inch in length. The branches are few in number, short and sometimes dichotomously dividing. When the animal is withdrawn, the openings of the tubes are closed. When the animal protrudes itself, the openings become patulous. The tentacula are about thirty, long, slender, though not of equal length, and ciliated. The inferior third of tentacula and external surface of the mouth cloated with long cilia which point towards the termination of tentacula, these do not move in a vibratory manner, but are sometimes closely applied to the surface and at others hang loosely. The gizzard and intestine very visible.

*The following species of Hydra, was discovered too late to be inserted in its proper place at page 11.*

#### HYDRAIDÆ.

Polypes gemmiparous, the young pullulating from the body of the parent.

#### HYDRA.

**Generic Character:** Polypes locomotive, single, naked, gelatinous, sub-cylindrical, but very contractile and mutable in form, the mouth encircled with a single series of granulous filiform tentacula.

**COMMON HYDRA.** *Hydra Vulgaris.* Body gelatinous, sub-cylindrical; tentacula seven to twelve, as long or longer than the body.

*Hydra vulgaris*, Ellis and Solander's Zooph., p. 9. Turton's Lin., vol. 4, p. 672. Stewart's Elem., vol. 2, p. 452. Templeton in Mag. Nat. Hist., vol. 9, p. 418. Johnston's Brit. Zooph., p. 95, pl. 1.

**Hab.** In the Trengwainton ponds, near Penzance. Common.

This, though a rare species in the country is common in all parts of the ponds; where it is to be found on *Nitella translucens* and other weeds growing there. If the usual descriptions of this *Hydra* are characteristic of its appearance, it would seem as if the one now under consideration was a distinct species. As, however the *Hydræ* are liable to great variations both in form and colour the present one has been referred to the *H. vulgaris*, as it bears the closest resemblance to it. It appears to be the variety *b. grisea*, Johnston; but though the tentacula are longer than the body, yet they are of

## CORALLINADÆ.

The productions embraced by this division of our subject, the "Articulated calcareous Corallines of Ellis," are essentially distinct from those previously described. In the foregoing Orders the presence of a *polype* has been deemed an indispensable requisite to their admission among Zoophytes; here however, after many examinations of the different species in their natural states, at different seasons of the year, and under a great diversity of weather, no polype has ever yet been discovered; consequently the calling of those productions Zoophytes is an error, as the arrangement now stands. Though destitute of polypes or any signs of animal life, many Authors still consider them in the light of animal existences; while others as zealously contend that they belong to the vegetable kingdom. In the early age of Natural History, these as well as the polypous zoophytes were considered vegetables. Ray speaking of the productions now under consideration, says "*Corallina est plantæ genus in aquis nascens, tenuissime divisum ex partibus constans articulatione quadam veluti conjunctis.*" This opinion was combated by Ellis, and from his superior knowledge he overthrew the reasonings of his opponents, though he failed in establishing their animal character as firmly as he had done that of the others. His views, however were generally received as correct, and Linnæus, who knew Ellis and in the study of zoophytes seems to have been his follower, though at first an advocate for the vegetable nature of all zoophytes, yet embraced the doctrine of the animal character of the polypous species and eventually of these calcareous corallines. He says; "*Corallinas ad Regnum Animale pertinere ex substantia earum calcarea constat, cum omnem calcem Animalium esse productum verrissimum sit.*" There never was any pretension to the discovery of a polype; hence its animal character depends on its calcareous structure. Cuvier's opinion appears to have been similar to that of Ellis, since he classes the articulated Corallines with *Crisia*, *Acamarchis*, *Farcimia*, and *Flustra*, between which there is not the least similarity except in the calcareous structure. Lamouroux also includes them in his work on Corallines; he says, however that he never saw the polypes, though he supposes the animal to be diffused in the form of retractile filaments; this is however purely ideal. In the *Millepora polymorpha* such a supposition might seem to receive a confirmation from a cursory observer, since it is not at all



uncommon to find long slender ciliated tendrils protruding in pairs from different parts of its surface. On examination, however, these are found to belong to a minute and beautiful worm,\* and which forms its tubes in the crevices or fissures, and sometimes on the surface. It would not be safe however to make the presence or absence of a polype an essential qualification for the animal or vegetable kingdoms. By so doing the Clustering Polype of Ellis and the sponges would be included among vegetables; the former of which and most of the latter are I think undoubtedly animal. From all that I have observed of them I am inclined to think they are situated on the vegetable side of the line which may supposed to divide the two kingdoms.

Though they are given up by Zoologists, yet the Botanist will not receive them, and thus they may be said to hover between the two kingdoms. Mr. Harvey has not included them in his manual of British Algæ, and Professor Graham, according to Dr. Johnston, says: "Let Zoologists keep their cryptogamia, the vegetable kingdom has more than enough." As, however, they are few in number, and have been classed among the zoophytes by many systematists they are here added as a supplement to the foregoing genera.

In character they are *encrusting, or arborescent, calcareous; articulated or massive; the surface in a recent state covered with minute pores, which disappear in drying: no polype.*

#### JANIA.

**Generic Character:** Arborescent, jointed; the joints cylindrical, dichotomously branched; the branches filiform.

**REDDISH HAIR-LIKE CORALLINE.** *Jania Rubens*, (VAR. A.) Calcareous, jointed, arborescent; lower joints simple, cylindrical, about four times as long as thick, nearly of equal thickness throughout: branches commonly

colour or pale green. It grows in tufts on rocks, or stems of fuci, in deep water; it is dichotomously branched, and the branches are filiform and spreading. The joints are long, slender, and cylindrical, of equal thickness throughout, or but slightly enlarged at the upper extremity. The two following species are considered to be varieties of this, by Fleming, Lamouroux and Johnston.

**COCK'S-COMB CORALLINE.** *Jania Rubens*, (VAR. B.)

Dichotomously branched, the upper part of the last joint but one very much enlarged; the upper part of the lower joint less so.

Crested or Cock's-comb Coralline, Ellis' Coral., p. 51, no. 7, pl. 24, fig. f F. *Corallina cristata*, Turton's Lin., vol. 4, p. 672. Stewart's Elem., vol. 2, p. 440. Ellis and Solander's Zooph., p. 121. *Jania rubens*, var. B, Fleming's Brit. An., p. 514. Lamouroux's Cor. Flex., var. C. (Cristata.)

*Hab.* Common on fuci on all our shores.

The chief differences between this and the last are, that the internodes are shorter and stouter, being about two and a half times as long as they are thick; the superior extremities of the joints are more enlarged, especially the last joint but one; and from the joints being shorter, and two branches arising from every joint, it is also stouter, and more bushy than the last.

It is also liable to great variations of colour, but is generally either red or green; but when washed ashore it is generally bleached.

**SEED-BEARING CORALLINE.** *Jania Rubens*, (VAR. C.)

Dichotomously branched; the joints swollen, but the terminal ones most so.

Seed-Bearing Coralline, Ellis' Coral., p. 51, no. 8, tab. 24, fig. g G. *Corallina spermophoros*, Turton's Lin., vol. 4, p. 672. Stewart's Elem., vol. 2, p. 440. Ellis and Solander's Zooph., p. 122. *Jania rubens*, var. D. Lamouroux's Cor. Flex. Fleming's Brit. An., p. 514. Templeton in Mag. Nat. Hist., vol. 9, p. 169.

*Hab.* On fuci, common. Polperro, Lantivet bay.

This approaches very nearly the Var. B. in character, but the branches are more loosely aggregated, more spreading, and rarely found in such tufts.

These two last are, I think, undoubtedly varieties of each other, and the figures of Lamouroux at pl. 9, figs. 6 and 7, are very characteristic.

**HORNED CORALLINE.** *Jania Corniculata.* Arborescent, dichotomously branched; the upper part of each joint horned.

White Slender Jointed Coralline, Ellis' Coral., p. 50, pl. 24, fig. d D. *Corallina corniculata*, Turton's Lin., vol. 4, p. 672. Stewart's Elem., vol. 2, p. 440. Ellis and Solander's Zooph., p. 121, no. 25. *Jania corniculata*, Fleming's Brit. An., p. 514. Lamouroux's Cor. Flex., p. 274. Bellamy's Nat. Hist. of S. Devon, p. 267.

*Hab.* On fuci. Lantivet, Tallandsand, and Mevagissey bays; common.

Of a delicate pea green colour, which soon bleaches to white, from exposure on the beach. This is the stoutest of all the dichotomously branching corallines found on our coast. It is readily recognized, by the joints being somewhat compressed, and above being prolonged on each side into a horn.

#### CORALLINA.

*Generic Character*; Arborescent, jointed; the joints slightly compressed, trichotomously branched.

From this Genus being trichotomously branched, the appearance of a primary stem is preserved, and the two other branches, appear to rise from the sides.

**COMMON CORALLINE.** *C. Officinalis.* Arborescent, jointed; joints somewhat wedge-shaped with truncated angles; lateral offshoots short, their internodes short and obtuse.

Coralline of the shops, *Corallina Anglica*, *Corallina alba Officinarum*, Ellis' Coral., p. 48, pl. 24, fig. a A. *Corallina officinalis*, Turton's Lin., vol. 4, p. 671. Stewart's Elem., vol. 2, p. 439. Fleming's Brit. An., p. 514. Ellis' and

Stewart's Elem., vol. 2, p. 439. Lamouroux's Cor. Flex., p. 285. Ellis and Solander's Zooph., p. 119.

*Hab.* In deeper water than the last, but sometimes mixed with it in deep pools.

This coralline very much resembles the last, of which it appears to be only a variety. It grows to a greater length, is more slender, and more branched and the branches more filiform than the *C. officinalis*, and is prostrate instead of being semi-erect.

**C. SQUAMATA.** Calcareous, jointed, trichotomously branched, joints compressed, two edged.

Upright English Coralline, with spear-like heads and flat joints, Ellis' Coral., p. 49, pl. 24, fig. c. *C. Corallina squamata*, Ellis and Solander's Zooph., p. 117. Turton's Lin., vol. 4, p. 671. Stewart's Elem., vol. 2, p. 439. Lamouroux's Cor. Flex., p. 287. Fleming's Brit. An., p. 515. Johnston's Brit. Coral., p. 222.

This delicate species is most commonly of a delicate pea-green colour. It resembles the *C. officinalis* in general appearance, but is undoubtedly distinct from it. The internodes are wider in proportion to their length and more compressed than in that species. The branches are erectopatent, joints linear, pointed and compressed at the edges. The compression of the edges is a character which is always present.

#### MILLEPORA.

*Generic Character:* Calcareous; form irregular, encrusting, with semi-circular plates; rising in knobular protruberances, or in kneed branches.

**LIVERWORT MILLEPORA.** *M. Lichenoides.* Calcareous, encrusting, with horizontal semi-circular plates which turn up at their edges, polished.

*Corallium Cretaceum Lichenoides*, Ellis' Coral., p. 76. *Millepora lichenoides*, Ellis and Solander's Zooph., p. 131, pl. 23, figs. 10, 12. Fleming's Brit. An., p. 528, no. 117. Bellamy's Nat. Hist. of South Devon, p. 269. Borlase's Nat. Hist. of Cornwall, p. 239, pl. 24, figs. 2, 5. *Millepora Alga*, Turton's Lin., vol. 4, p. 639. Stewart's Elem., vol. 2, p. 428.

*Hab.* On the common coralline, in pools; very common.

When recent it is of a reddish brown colour, paler towards the edges. It encrusts the stems of the common coralline, of which it is thought to be a variety, and sends off horizontal semi-circular plates, which are turned up at their edges. When recent, it will be found marked by

minute pores on the upper surface. These disappear in drying, and the colour changes to a very pale brown.

**BRITISH CORAL.** *M. Polymorpha*. Calcareous, encrusting, rising either in globular heads or kneed branches.

*Corallium pumilum album*, fere lapideum ramosum, et *Corallium album pumilum nostras*, R. S., Ellis' Coral., p. 76, pl. 27, no. 1, C. *Millepora polymorpha*, Ellis and Solander's Zooph., p. 130. Turton's Lin., vol. 4, p. 638. Fleming's Brit. An., p. 528. Stewart's Elem., vol. 2, p. 426. Bellamy's Nat. Hist. of South Devon, p. 269. Sprig or branchy Coral, Borlase's Nat. Hist. of Cornwall, p. 239, pl. 24, figs. 4 and 5.

*Hab.* On rocks from the Rame Head to Falmouth; abundant in the Falmouth mud.

On the rocks, it is found encrusting, and rising into globular heads sometimes singly, and at others congregated like a bunch of grapes. In the Falmouth mud it occurs as kneed branches in abundance; from the time of the Naturalist Ray, to the present time, a period of about 150 years, it has been used, in that neighbourhood, as a manure without much apparent decrease of the supply. Its virtues as a manure are increased, either by burning, or beating to a coarse powder.

**SUPPLEMENT**  
**To the Two First Portions**  
**OF THE**  
**CORNISH FAUNA,**  
*By JONATHAN COUCH, F.L.S., &c.*

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It is desirable that as each successive portion of this compendium of the Natural History of the County is produced to the public, a record shall be made in it of such species of the families treated of in the former parts, as may have been discovered since their publication; or where they are already known, but as of rare occurrence, that such additional information shall be given as may lead to a more extended knowledge of them. Something like this has been already attempted at the end of the second part; where the new discoveries are enumerated in a report which was originally read before the section on Natural History of the British Association for Science, when it assembled at Plymouth in the year 1841. Our additions at this time therefore must be regarded in the light of a second supplement; and in adding it to that which there is reason to regard as being the last that will probably appear in any close connection with the enquiries of the author of the two former, he will employ the occasion now presented to him, to express the pleasure he feels in knowing that observers of nature in the field and flood, have within a few years so greatly increased, as well in ability and accuracy, as in numbers. He can well call to mind a time when that individual was thought to be possessed with some great singularity of taste, who could be prompted in rain or sunshine, fair or stormy weather, to wander among the recesses of the shore, to search out and examine the strangely formed creatures of God in their native haunts. There was no kindred spirit to hail his success, nor any accessible periodical through which to pour out his pleasure of discovery, and increase it by communication to the equally solitary

labourers in the same field, thinly scattered through the land. These were the times when a Lady of rank and fortune was subjected to an accusation of insanity, for which the principal proof advanced was, that she had made a collection of Butterflies.

But a wiser and more kindly spirit has prevailed; and those who neither know nor care to know the works of skill and beauty which their Creator did not disdain to make, are yet at least found to respect the study; and the number of those who observe and labour is greatly increased. It is from the latter circumstance that so many additions are continually making to the catalogue of known, and especially of our native animals. Gentlemen are found who will show so much respect to the Naturalist or a Public Institution, as to preserve for them such rare specimens as may fall in their way; and we are consequently less accustomed to hear of the occurrence of rare or unknown Birds and Fishes, that have been wondered at, and thrown aside.

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#### THE WHALE TRIBE. CETACEANS.

**BLACK OR LEADING WHALE.** *Delphinus melas*.  
Fleming's British Animals, p. 34. *Phocæna melas*, Bell's  
British Quadrupeds, p. 483. *Delphinus deductor*, Scores-  
by's History of the Arctic Regions.

A specimen of this Whale was taken on the 29th of March, 1842, on Looe Island; and another in the following year, on the mainland nearly opposite the same place. Of the former I had an opportunity of making a sketch, and minute examination: which were published in the *Annals of Natural History*, vol. 9, p. 371, pl. 6. It was there re-

form assigned to the figure both of Scoresby and Bell (though most obvious in the latter) lead to a suspicion that the latter is indebted for its existence to the former, and consequently that the engraving of Dr. Trail, whom Scoresby has followed, is the only undoubted original.

The following notes, which were made when comparing the figures of Bell and Scoresby (whose description at least is from Trail) with the animal lying favourably before me, will point out the differences. In Mr. Bell's work, the bulk is much too slender, especially on the anterior portion, and not enough compressed posteriorly, nor sufficiently ridged on that part, above and below. The caudal fin is too much divided and attenuated at the sides; for though a single specimen might chance to die in the attitude given, nothing short of an error in the outline could represent the corner of the tail so long and slender. The forehead also is not sufficiently prominent and globular: the teeth are too numerous and conspicuous; the under jaw too much projecting. Jenyns represents the teeth conical and sharp, but in this specimen their points were blunt. The pectoral fin is not well represented in the figures; and the dorsal is placed too far behind, its exact position being, as far as the eye can judge, just above the centre of gravity. The length of this animal, measured along the curve, was twenty two and half feet; and the quantity of oil produced from it seventy gallons.

Remains of Hakes (*Gadus merluccius*) were found in the stomach of the second specimen.

#### FALCONS.

**GYRFALCON.** *Falco Islandicus*. Jenyns Manual, p. 27.

Gyrfalco candicans, Fleming's British Animals, p. 51.

Falco gyrfalco, Bewick's British Birds, vol. 1. Yarrell's British Birds, vol. 1, p. 26.

This Bird has hitherto occupied a place in the catalogue of the Cornish Fauna on the authority of a single specimen recorded by Borlase. Another instance of its occurrence is now to be added, on the authority of E. H. Rodd, Esq. in whose beautiful collection at Penzance the specimen is preserved.

**ASHCOLOURED HARRIER.** *Buteo cineraceus*. Fleming's Br. An., p. 55. Jenyns's Man., p. 90. Bewick's Br. B., vol. 1. Circus Montagui, Yarrell's Br. B., vol. 1, p. 100.

In a communication to the Royal Institution of Cornwall in 1840. (Report, p. 76.) Mr. Rodd has expressed his



opinion that the specimen in the Museum at Truro supposed to represent this species, is erroneously marked; but he announces the possession of two specimens, a male and female, killed in Cornwall, and in his own collection.

**GREAT BUSTARD.** *Otis tarda*. Turton's Lin., vol. 1, p. 436. Bewick's Br. B., vol. 1, p. 314. Fleming's Brit. An., p. 115. Jenyns' Man. p. 174. Yarrell's Br. B., vol. 2, p. 362.

A specimen was shot on Goonhilly Downs, early in February, 1843; and it is now in the collection of E. H. Rodd, Esq. at Penzance. Of course it was a straggler from some eastward portion of the kingdom; and we may be permitted to regret that the rarity and value of the bird should deprive it of the chance of being propagated in a situation so well adapted for its residence.

**RED LEGGED PARTRIDGE.** *Tetrao rufus*. Turton's Lin., vol. 1, p. 456. Bewick's Br. B., vol. 1, sup. p. 39. *Perdix rufa*, Fleming's Brit. An., p. 45. *P. rubra*, Jenyns' Man., p. 172. Yarrell's Br. B., vol. 2, p. 343.

About the middle of September, 1842, a specimen of this bird was shot in the parish of Lanreath, and was sent to Mr. C. Jackson of East Looe, to be preserved.

#### SYLVIADÆ. WARBLERS.

**GARDEN WARBLER.** *Curruca hortensis*. Fleming's Br. An., p. 70. Sylvia H., Bewick's Br. B., vol. 1. Jenyns' Man., p. 108. Yarrell's Br. B., vol. 1, p. 285.

Mr. Rodd has added this species to the catalogue of Cornish birds; but its distribution seems to be local. It is found at Trebartha.

It has been shot near Penzance, and I believe at other places in the county

#### ANTHIDÆ. PIPPETS.

**RICHARD'S PIPPET.** *Anthus Richardi*. Fleming's Brit. An., p. 75. Jenyns' Man., p. 117. A. Richardi, Yarrell's Br. B., vol. 1, p. 398.

This species of Lark has been usually regarded as rare; and it is not many years since I was present at a meeting of the Zoological Club of the Linnean Society when the first known specimen was produced for examination. But it is probably less rare than has been supposed; since four specimens were secured at one shot, in a field close to Penzance. It was noted that in their habits they were tame and void of suspicion.

#### HIRUNDINIDÆ. SWALLOWS.

**ALPINE SWIFT.** *Cypselus alpinus*. Jenyns' Man., p. 159. Yarrell's Br. B., vol. 2, p. 239.

In the first part of the Cornish Fauna the occurrence of this bird was noted, with something like the expression of uncertainty. But it is now rendered clear by the capture of a specimen, which flew on board of a vessel, about the middle of June, 1842, at about 40 miles west of the Land's end, and it was so fatigued as to be easily taken.

#### SCOLOPACIDÆ. WOODCOCKS.

**PECTORAL SANDPIPER.** *Tringa pectoralis*. Jenyns' Man., p. 210. Yarrell's Br. B., vol. 2, p. 654.

An account of the specimen of this rare bird that was shot in the Scilly Islands, is given in the Report of the Royal Institution of Cornwall, in 1840, by E. H. Rodd, Esq., and further particulars of the same specimen are contained in Mr. Yarrell's work, from D. W. Mitchell, Esq., by whom the bird was shot. Another individual escaped.

**WOODCOCK.** *Scolopax rusticola*. Turton's Lin., vol. 1. Fleming's Brit. An., p. 105. Jenyns' Man., p. 204. Yarrell's Br. B., vol. 2, p. 583.

The instances in which this bird has been known to pass the summer with us, are rare; and in Borlase's Natural History of the county is the only authentic record of the discovery of its nest. But in the first week in June, 1843, a young Woodcock was sent to Mr. C. Jackson, for preservation, that was found on the public road near Bodmin, and when discovered it was scarcely dead. As it was not of age for distant flight, it was judged to have been dropped where found, by the parents; which have been supposed to

be in the habit of carrying their young to their feeding places, before they have acquired sufficient strength to convey themselves.

**COMMON BITTERN.** *Ardea stellaris.* Turton's Lin., vol. 1. Fleming's Brit. An., p. 95. Jenyns' Man., p. 190. Yarrell's Br. B., vol. 2, p. 475.

There is no need to record this bird for its rarity; but it seems to abound much more in the west than in the eastern part of the County. But it is here inserted to notice its food. I am assured that in one instance a Red Wing, (*Turdus Iliacus*) and in another a Rail, (*Gallinula Crex*) was found in its stomach.

**SPOONBILL.** *Platalea leucorodia.* Jenyns' Man., p. 193. Yarrell's Br. B., vol. 2, p. 499.

In the third week of October, 1843, nineteen of these birds were seen on the north coast of the county, near Newquay, and four of them killed: of which I examined a specimen. In the previous year, one was shot on the Goonhilly downs, and it is believed that these are not the only instances in which it has been taken.

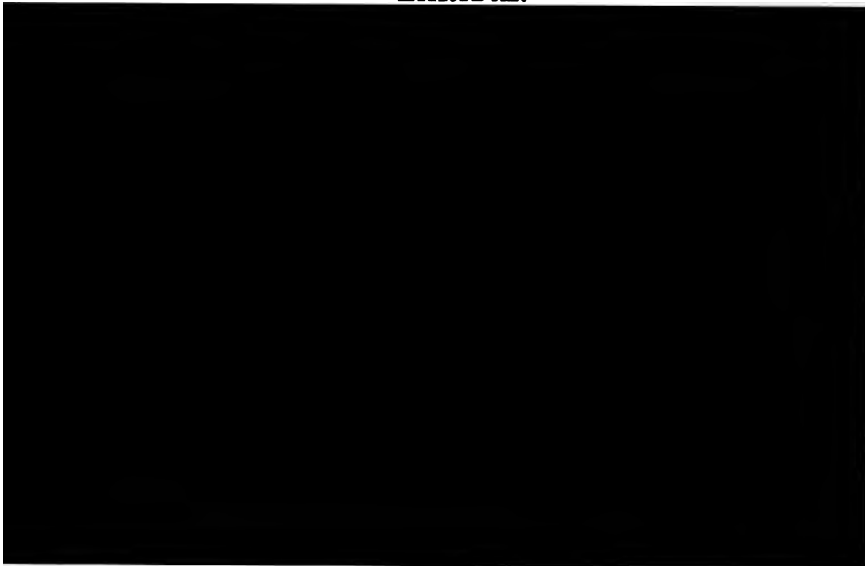
A hen bird shot at Tregembris in Newlyn is in the Museum, having been presented by Mr. Robarts.

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**ALCADÆ.**

**RINGED GUILLEMOT.** *Uria lacrymans.* Yarrell's Br. B., vol. 3, p. 351.

Since this bird has been judged a separate species from *Uria Troile*, it has been found to be as common as the latter.

**LARIDÆ.**



## CHELONIADÆ. TURTLES.

**CORIACEOUS TURTLE.** *Testudo coriacea*. Turton's Lin., vol. 1. *Coriudo cor.* Fleming's Brit. An., p. 149. *Sphargis cor.* Jenyns' Man., p. 290. Bell's Br. Reptiles, p. 11.

The occurrence of any of the Turtles in the British seas is so rare, that it seems proper to note every instance of it; even where as in the instance presently to be given, an opportunity has not been afforded of examining the specimen. The following paragraph is extracted from the Falmouth Packet Newspaper, of the date of August 10, 1839. "Penzance. On Saturday last at about 7 o'clock in the evening, as the Trinity buoy yacht was coming into the bay from the Wolf Rock, something was observed about two miles from Penberth core floating on the water, which appeared to be a boat, bottom up. They bore away towards it, and discovered it to be an immense Turtle. They manned their boat and pursued it more than an hour, during which it dived and rose to the surface several times. They were within a boat's length of it twice, but it eluded all their attempts to take it. They report it as the largest they ever saw." The species of Turtle to which I have referred this announcement, was long since recorded by Borlase as taken in Cornwall; who mentions of one of near eight hundred weight. But there is a description of another species,—*Chelonia caretta*,—in the 4th vol. N. S., of London's Magazine of Natural History, p. 136, that was caught in January, 1840, at the mouth of the river Tor in Devonshire, and which weighed about two hundred pounds.

## SPARIDÆ. SEA BREAMS.

**ORPH, COUCH'S SEA BREAM.** *Orphus Rondeletii*. *Pagellus Rondeletii*, C. Zoologist, vol. 1, p. 81.

The Sparoid fishes are found to bear so considerable a resemblance to each other in form and colour, and until very recent times, have been so inadequately represented in figures, most of which have been taken from dried skins or prepared specimens, in which all the distinguishing marks of life, and separation from one another have been lost—that we need not wonder if we occasionally find the synonyms misapplied, the references to ancient authors misplaced, and certain species rediscovered, that have a better title to a designation than others which for a time have been permitted to bear it. Another fertile source of error arises

from the fact, common indeed to species of other families in nature, that several fishes bear different names in different places; and, still worse, in some instances the same name is applied by the same people to separate species: not from supposing them the same, but from some characters which they possess in common, of which this name is descriptive, though in other respects the species widely differ. Many curious instances might be given in illustration of these remarks, but scarcely any one has led to a greater extent of confusion than this species; which appears to have been known to some ancient Naturalists, but which hitherto does not seem to have fallen into the hands of any recent enquirer.

The specimen here described was taken November 8th, 1842, with a baited hook, at a place termed the Edges, a margin of rocky ground running parallel with the land at the distance of three miles south of Polperro. The weight was six pounds: the body in figure and thickness not unlike that of the common Sea Bream (*Pagellus centrodontus*) but rather deeper and more stout. The head thick, the muzzle remarkably so, and rounded, the line of the front sloping suddenly from the forehead to the mouth; the eyes of moderate size, elevated, and near the front, iris yellow; nostrils in a slight depression, the superior large and patulous; jaws equal, in a line with the front, the lower with a well marked chin; the teeth in front rather stout, somewhat separate, those of the upper and lower jaws interlocking. The scales large, and conspicuous on the posterior plate of the gillcovers; the middle plate has none, and there are but few vestiges on the anterior plate. The head being short, the back rises high above it. The lateral line very dark, less curved than in the more common Sparoid fishes,

chin, are sufficient to distinguish this species from any one hitherto recognized as British. At the same time it so nearly agrees with the figure and description of the Orphe of Rondeletius, that I have little hesitation in believing it to be the same fish. His account is this; "Ὀρφεῖς ou Ὀρφεως. Les Latins ont rétenu ce nom horsmis Gaze du quel est appelé Cernua. Il est poisson marin de rivage, aucunement semblable au Pagre rougeastre. Il ha les jeux grands, les dens qui entrent les unes entres les autres. De nombre, de situation dâelles, déguillons semblable au Pagre. Il ha le trou de excremens fort petit; car il ha seulement une petite fente laquelle vous ne verres sans presser le ventre; il n'ha point de vaisseaux spermatiques, (certainly an error of the observer). Tel est noster orphe, au quel convient tout ceque Aristote à Atheneé ont attribué. En peu de tems il devient grand, il est mangechaire, solitaire, il ha des dens qui se serrent les unes entre les autres, il est caché en hyver," p. 139, of the French edition.

It is intimated by Rondeletius that among the Greeks more than one fish was known by the name of Orphus; and we further learn that the word, Cernua, by which some Latin writers have rendered the Greek Ὀρφεως has been applied to a still greater number of species, all of them distinct from this, and even from the River Rud: the true Cernua of the Moderns. After stating this, Gesner, who copies the figure of Rondeletius, adds: nos (inquit Rondeletius) orphum hic non depingimus eum, qui a Græcis quibudam hodie vulgari lingua orphi nomine dicitur. Est enim nostro longe major, utpote qui pondere viginti libras æquet, nec sit litoralis. Sed orphum dipingimus ex Aristotle, Athenæo, Plinio. Is Piscis est litoralis magis quam pelagius, Pagro quodammodo similis colore ex purpureo rubescente, idea rubentem appellavit Ovidius; (verum hæc apud Plinium ex Ovidio non recte citatæ eguntur.) Ovidius pelagium facit, Aristoteles vero Ælianus litoralem. Oppiano degit in petris cavernosis, quæ plenæ sunt chamis et patellis (quibus nimirum vescitur.) Græci hodie, ut dictum est alium Piscem vulgo orphum vel Rophum appellant; quem Bellonius orphum facit. Ray (Synopsis, p. 133,) who limits the name Orphus to the Rud, describes the fish which he terms Orpheus veterum, from Rondeletius, in a manner to show that he was altogether unacquainted with it; and as the species termed Orphus by Bellonius is the other and more common one known by this name among the Greeks, we need not wonder at finding Ruysch (Theatrum Animalium, vol. 1, p. 24,) resigning all hope of extricating from such utter confusion what he saw might still be a well defined species. Nor does it appear that even the most

industrious and attentive Naturalists of the present day have been more fortunate than their predecessors in obtaining a knowledge of this species. Risso makes no mention of it in his *Ichthyologie de Nice*; and Cuvier is equally ignorant of it, for his *Pagrus Orphus* is a very different fish, and he supposes the Orphe of Rondeletius, to which I have referred the fish now described, to be no other than our common Sea Bream: the *Pagellus centrodonatus* of his own work. The Dorade Orphe of Risso is pronounced by Cuvier to be his own *Pagellus Orphus*. We see that it is represented by Rondeletius as solitary and rare, and by Oppian as only locally common; while even Pliny's remark, that it had only been described by Ovid, though erroneous in itself, yet leads to the inference that according to his information it was not often caught: these are circumstances which, taken together, will assist us in understanding the reasons of the doubts which have hitherto hung over this species.

The specimen above referred to is deposited in the national collection in the British Museum.

**SHORT SEA BREEM.** *Pagellus curtus*. C. Zoologist, vol. 2, p. 393.

On the second of September 1843, a fisherman took with one of his ordinary baits a Sea Bream, which he presently discerned to have never before fallen under his notice; and in consequence it was transferred to my possession as soon as he reached the land, which was before sufficient time had elapsed to allow it to undergo any change. Its length was one foot two inches, the greatest depth nine inches and a half, and, in proportion to the kindred species, it was of considerable thickness. The under jaw was slightly the longest, the teeth in front and forward on the sides slight,

just above the origin of the rays of the pectoral. Tail lunated.

P. 15. D. 12, 12. V. 1, 5. A. 3, 13. C, about 20.

Colours much as in the common Sea Bream, but more vivid; top of the head rich brown; the back scarlet red, lighter on the sides, the belly white, with slight mottlings. Dorsal, pectoral and caudal fins, and within the mouth, vermillion; ventral and anal fins paler. Compared with the common Sea Bream laid beside it, beside the remarkable difference in the dimensions, it is distinguished by a wider gape, by teeth less thickly placed, though resembling in arrangement and structure, especially the incisors; by a less rounded muzzle, a much larger eye, and longer pectorals, which are also differently shaped, being more arched. In a common Sea Bream of the same length these fins were three inches and three quarters long. The scales also were more decidedly waved at their edge. In the stomach I found a Comatula and the bait, a slice of fish, with which it was taken; but in the lower intestine were rather broad-pieces of brown sea-weed, covered with *Flustræ*, but this being undigested, seems not to be its ordinary food.

At the first glance I was led to suspect that this fish was nothing more than a dumpy specimen of the common Sea Bream; but it differed in so many particulars, beside the shortened form, that on minute examination I have been compelled to conclude that it is a separate species; in which opinion I am supported by the decision of an eminent Naturalist. I have not been able to discover any species at all closely resembling it in the works of Rondeletius, Gesner, Ray, Linnæus, Gronovius, Risso or Cuvier; and am therefore compelled to conclude that it is now for the first time described: a circumstance the less to be wondered at, when we recollect that even in the limited waters of the Mediterranean, and so near a region also as Madeira, several fishes have been recorded of which only a single specimen has been obtained. The fish here described has been deposited with the next preceding, in the British Museum.

BOGUE. *Boops primus*, Ray's Synopsis, p. 135. *Box vulgaris*, Cuvier; but in his plate *Boops V.* Spare bogue, Risso, Ichthyologic, p. 242.

A specimen of this fish, the first recorded as taken in Britain, was caught in a ground sean at St. Mawes, in the early part of October, 1842; and coming into the possession of Alfred Fox, Esq., was kindly presented to the Museum at Truro. It is abundant in the Mediterranean; but has rarely been taken out of it.

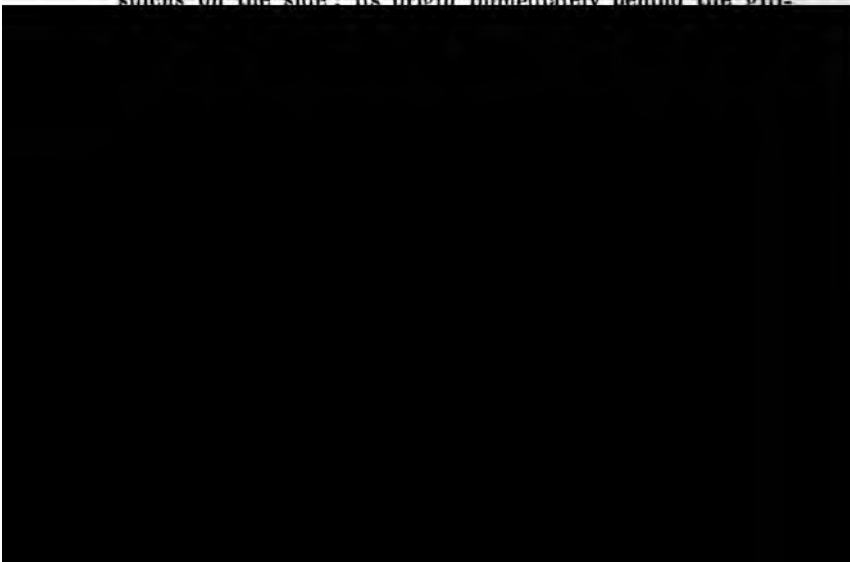


## SCOMBERIDÆ. MACKARELS.

**PLAIN BONITO.** *Auxis vulgaris*, Cuvier who pronounces it to be *Scomber bisus* of Rafinesque, and *S. rochei* of Risso, Ichthyologic, p. 165. Yarrell's Brit. Fishes, 2nd. edition, vol. 1, p. 160.

By the older Naturalists this species was confounded with two or three others under the general name of Tunny. It is of such rare occurrence in the British seas as not to have been recorded in the first edition of Mr. Yarrell's work. Two specimens afterwards came into the possession of that Gentleman from Yarmouth. A third specimen was taken in a mackarel sear at Looe in June, 1843, and came into the hands of Mr. Clement Jackson; to whom I am indebted for a characteristic outline of its form.

A second Cornish specimen was taken near Penzance in a mackarel sear, in the beginning of July 1844: and of it I received the following description, from Mr. Richard Quiller Couch, into whose hands it came. Length eighteen and a half inches, girth behind the first dorsal fin eleven and a half inches. Viewed laterally it has a resemblance to the mackarel, but is more plump, and the tail seems proportionally smaller. From the point of the lower jaw to the margin of the gillcovers four and a half inches: both jaws pointed; mouth small, teeth small and fine. Eye large, an inch from the snout. First dorsal five inches from the snout, placed in a fissure which hides it when closed: its fin rays somewhat spinous, the first two longest and closely united; from first to second dorsal six inches; the latter crescent shaped. Tail lunated, the vertebræ nearly reaching its edge. Ventral fin resembling the second dorsal; finlets eight above, seven below. Pectoral fin small, stout, in a sulcus on the side: its origin immediately behind the gill-



**LONG FINNED TUNNY.** *Scomber alalunga*, Linnæus.  
*Orcynus ala longa*, Cuvier. Risso, *Ichthyologic*, p. 169.

In my visit to Penzance in February 1844, I found a specimen of this well marked species in the Museum of Natural History there. It was taken in the bay, and is the only specimen known to have been caught in Britain. It may be easily recognized by the great length of the pectoral fins.

**BLACKFISH.** *Centrolophus pompilus*, Cuvier. Yarrell's Br. F., vol. 1, p. 179.

The only specimens of this fish hitherto recognized as British, were taken in Cornwall, and are recorded in the first portion of our Fauna, and in Mr. Yarrell's British Fishes. To these a fifth specimen is to be added, that came close to a boat at St. Ives, and was hooked with a gaff. In this instance its instinct led to its destruction; for it was the opinion of the ancients that this fish was in the habit of following ships at sea, and manifesting great attachment to them, so as not to be driven away by violent attempts to take it. Some obscurity has been thrown on this part of its history, by confounding it with the Pilot fish (*Naucrates ductor*) which is more frequently seen to manifest the same habits: just as also, the adhesive habits have led to similar errors concerning the sucking fishes, *Petromyzon marinus* and *Echeneis Remora*. Compare Oppian, book 1st., with Pliny, book 9, chapter 15.

**DOREE.** *Zeus faber*, Linnæus. Yarrell's Br. F., vol. 1, p. 183.

As one object of the Naturalist is to study the habits of the creatures of God, I will record an instance of the voracity of this fish. In a specimen twelve inches and a half in length, I found twenty-five flounders, of which few were less than two inches and a half long; three half grown Sting fishes (*Cottus scorpio*) and five stones of the beach, of which the largest was one inch and a half long: taken up, as I suppose, in its eagerness after prey. The Cotti were partly digested, the flounders not at all. The Dory was so gorged with its gluttony, as to suffer itself to be taken with the hand.

**BOAR FISH.** *Z. aper*, Linnæus. Jenyns' Man., p. 368.  
*Capros aper*, Risso. Yarrell's Br. F., vol. 1, p. 190, 2nd. edition. *Zoologist*, vol. 1, p. 191, the latter from a British specimen, and differing in several particulars from Mr. Yarrell's figure; that was derived from a fish caught in Madeira.

It is only of late that this species has been recognized as British: the first on record having been taken in Mount's bay. Another has come to my knowledge, that was purchased in the market at Falmouth in 1841; but in July 1844, on the first adventure to sea of a trawl vessel from the port of Penzance, a very considerable number of this fish was taken. My Son, who was present, counted and examined sixty of them; and the fishermen informed him that they had thrown some overboard, as worthless. The following description was taken from some of those specimens, and compared with others. Length varying from five to seven inches. In one of the latter size, depth in front of the first dorsal spine three inches, girth seven inches. Snout prolonged, and capable of still greater extension, to the length of seven eighths of an inch. Above the eye it is narrow, and it then is arched concavely upward and backward, in a waved form to the origin of the first dorsal, which is the highest point; from whence it slopes backward to the stalk of the tail. The eye large, round, five eighths of an inch in diameter, and the same from the snout when the month is closed. When extended the snout is membranous, and surrounded anteriorly with a rim of bone, forming the jaws; on the upper part of which is a long stout bone which passes into a conspicuous socket between the eyes; and anteriorly it expands on each side like two wings, which terminate in two horns. From the orifice of the socket posteriorly a small slight bone passes obliquely downward and forwards to meet another from the rim of the mouth: thus forming a nearly equilateral triangle with the base above. The rim of the lower jaw is attached loosely to the anterior side of the triangle; and when the mouth is closed the whole of this mechanism resembles a

at the middle; they are longitudinally striated, and the first three are more elevated at their root than the others. There are no scales at their base. The second dorsal is soft, and placed on a ridge. Abdominal fin with the membrane not extending to the ends of the soft rays. In Mr. Yarrell's figure the first rays of the dorsal fin are represented as serrated; which was not the case in these specimens; that mark being limited to the first ray of the ventral, which is strongly so.

D. 9, 24. P. 13. V. 1, 5. A. 3, 24. C. 14.

Colour of the eye bright yellow, and silvery white; of the body a fine crimson, delicately bright, faded into yellow, and from thence to a silvery white as it approached the belly. There were no lateral bands, as are sometimes described.

Within a few days after the capture of this quantity of these fishes, two others were obtained: and in the week ending the 28th of the same month, about an hundred additional specimens were taken, and all the specimens that passed under observation exceeded two hundred.

#### GOBIADÆ. GOBIES.

**YARRELL'S BLENNY.** *Blennius gallerita*, Fleming's Brit. An., p. 207. B. Palmicornis, Jenyns' Man., p. 380. Yarrell's Br. F., 1st Ed., vol. 1, p. 233. B. Yarrellii, Cuv. and Valenciennes. Yarrell's Br. F., 2nd Ed., p. 263.

My first specimen of this Blenny was procured in 1841; and being rare, and the individual of large size, it was deposited in the British Museum. Since that time several have come to my hands; of which two or three were presented from Gorran, by Mr. Peach; and a comparative examination of these enables me to point out some variations to which this fish is subject, and thus to reconcile the contrariety of description by different Naturalists, of which Mr. Yarrell takes notice. The characters here given are designed to have reference to Mr. Yarrell's figure and description, both in their resemblance and difference. Lips and cheeks tumid, under jaw rather the longer; teeth very small, regular, close set; eyes approximate, elevated. Belly tumid, body lengthened, compressed. Lateral line double, the upper soon becoming obsolete, but having its beginning from a row of pores running back from the summit of the cheek. Membrane of the dorsal and anal fin bound to the caudal. Colour uniform light brown, covered with fine scales, each with a paler rim. Between the eyes a slender process; on the front of the head two, elevated, crowned with a tuft of fibrils; and on the top of the head, above the centre of the eye a more elevated process, which in a fish

measuring seven and a quarter inches, was three quarters of an inch high: branched like a stag's horn behind and on the top. Separate threads on the neck: the first ray of the dorsal fin with a branching tuft, the second with a couple of shorter fibres.

In another specimen the tufts on the head were more divaricated; but in all cases the tendrils pointed backward. In most of the specimens the colour was a light brown, with a distinct brown line from the base of the anterior supra-ocular process, curving round the anterior margin of the eye, and thence descending below the angle of the mouth. At the upper margin of the gills the outlet is formed by a gathering of the skin into a tube.

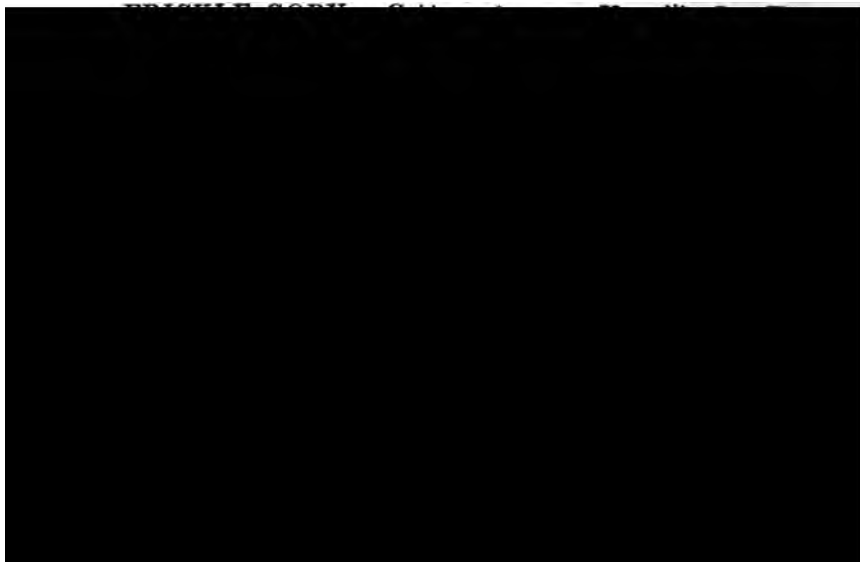
Fin rays, D. 50, 51. P. 14, 14. A. 35, 39. C. 16, 16. V. 3, 2.

The ventral fins were soft; in one specimen, with three soft rays; in the other, with two palmate rays.

**WOLF FISH.** *Anarrhichas lupus*, Linnæus. Fleming's Brit. An., p. 208. Jenyns' Man., p. 384. Yarrell's Br. F., vol. 1, p. 277, N. E.

This is a fish of the north sea, and not much disposed to wander from its usual haunts. When therefore I was informed that a specimen had been taken at Fowey, I felt inclined to doubt its certainty. But I have since been informed by Mr. J. C. Bellamy, the author of the Natural History of South Devon, that he possessed a specimen taken in the neighbourhood of Plymouth; and as the usual fishing ground of that port, is off the Cornish land, it renders the report from Fowey more probable, and is in itself some ground for placing this species in our catalogue.

#### POLEWIG.



is well known to heighten the colours of fishes. The Polewig sometimes abounds in considerable schuls, and seizes a bait with eagerness: habits which are not common to the fishes of this genus. The size of their mouth is too diminutive to admit of their receiving a hook; but their firm holdfast of the bait and probably the curvature of their teeth, described by Mr. Yarrell, were the cause that many of them were captured by angling; but they fall off from the hook when lifted high above the water.

**WHITE GOBY.** *Gobius albus*. Yarrell's Br. F., vol. 1, p. 295, 2nd edition.

This obscure species was first noticed by Dr. Parnell; and though appearing sufficiently distinct, from its form and proportions, to be regarded as a separate species, it affords some grounds for hesitation, that none have been examined but such as are clearly in the first stages of their existence.

#### CLUPEIDÆ. HERRINGS.

**WHITE BAIT.** *Clupea alba*, Yarrell's Br. F., vol. 2, p. 202.

Whilst this little fish was considered the young of the Shad, no search was made for it beyond the region where it had become an article of luxury. Mr. Yarrell was the first who decided it to be a distinct species; and since then it has been sought and found in other rivers besides the Thames. During the summer of 1843 the favour of a gentlemen supplied me with a few specimens from the Fowey, which I have been able to compare with some in my collection from the Thames, with which they exactly agree. I am assured that they abound in the Fowey and I consequently conclude that if sought for within the reach of the tide, they might also be taken in the Tamar, and in the Fal, at the least between Falmouth and Truro.

#### CARTILAGINOUS FISHES. CHONDROPTERYGII.

##### RAIIDÆ. RAYS.

**CRAMP RAY.** *Torpedo*.

The wonderful properties of the Cramp Rays, unlike any thing found in other classes of the animal kingdom beside fishes, and confined to few even of them, has solicited the attention of philosophers at all times; but disregarding the minute differences that form specific characters, writers on Natural History have not judged until recently that there might be more than one species of the race. And when this has seemed to be probably established, it was still a matter of doubt to which of the acknowledged species the specimens taken in Britain should be assigned a matter

still remaining in doubt, as the fish is not often taken, and when it occurs a competent observer may not be present to take advantage of the circumstance. The examination of a single specimen therefore becomes a matter of interest; since it may enable us to settle the value of the assumed marks of distinction, and to assign the synonyms of our British species.

The descriptions we possess of these fishes represent the specimens as having great variety of colour; as may be seen in Risso's plates (*Ichthyologie de Nice* pl. 3,) where one is of very pale brown, with slight but numerous pale blue spots, and a larger ocellated spot of deeper blue on the centre of the disk: with a pale waved line from each temporal orifice to the tail. In another the colour is a uniform reddish buff; and the third is a dull brown, thickly covered with small dark spots. In Matthiolus' edition of Dioscorides, the colour is described as reddish, with five regularly arranged large ocellated spots; which are seen only in the adult fish. Gesner (*Nomenclator aquatilium*, p. 124,) gives two figures, in each of which five large spots are regularly distributed; but they differ from that of Matthiolus in having the spot which lies in a direction with the dorsal line, close behind the head; whereas in the figure of the latter author this intermediate spot is the most remote from it. When we add to this, that in most of the Ray kind there is a disposition to formation of spots and circles, but that they vary in their occurrence, form and situation, and that the supposed Cuckow Ray (*R. miraletus*) derived its only authority from these accidents, we may safely venture to conclude that little dependence should be placed on them for the distinction of species. They have not usually occurred in the specimens taken in Britain, and I believe not at all on those seen in Cornwall: in which they confirm a remark that I have



by the former mark. A large specimen of this last named species was taken in the Mount's bay, and is well preserved in the museum of the Society for Natural History at Penzance. From an examination of this I derive the following description: length three feet two and a half inches; extreme breadth two feet three inches; the margin much rounded, and expanding much more than in either of Mr. Yarrell's figures. Mouth narrow, and apparently feeble, the under jaw curved forward in the shape of a horse shoe; teeth small and sharp; temporal spiracles with an even continuous border. Colour of the upper surface deep brown, the skin smooth, sprinkled with small shot-like spots having some approach to regularity of distribution. The posterior lobe of the body has a regular fin with nineteen rays, of which three at the two extremities single, the others double. Of the two dorsal fins the anterior is partly on the lower lobe of the body, two inches and a half long, two inches and three quarters high; the distance between them two inches and three eighths. Second dorsal one inch and a half long, two inches high; from which to the caudal fin, two inches and a half. Eyes small, two inches and three eighths apart.

Mr. Dillwyn (History of Swansea, p. 61.) describes a specimen clearly similar to the above, that measured in length forty-two inches, thirty inches wide, and weighed forty-three and a half pounds, and an observation of that gentleman on his specimen before and after it was set up for preservation, will explain much of the discrepancy observed in the descriptions and figures of these fishes given by different authors. With the utmost care that was employed, the specimen, between the time of its death and preservation was found to have stretched from forty-two to forty-nine inches in length, and to have diminished in breadth from thirty inches, to twenty-four, a circumstance which will explain the disproportionate dimensions of Risso's figures, and the want of expansion in even the British engravings. The specimen at Penzance had been measured previously to setting up; and it is now fixed on a board suited to its natural figure.

#### SQUALIDÆ. SHARKS.

**HAMMERHEAD.** *Squalus zygæna*. Linnæus. Risso, Ichthyologie, p. 34. *Zygæna malleus*, Jenyns' Man., p. 507. Yarrell's Br. F., vol. 2, p. 504.

More than a single specimen of this curious and voracious Shark, have been taken in Cornwall; but the only one preserved, is in a dissected state in the museum of Natural History at Penzance.



## SHELLS.

**NATICA INTRICATA.** *Natica intricata*, Fleming's Brit., An., p. 319. *Natica intricata*, Donovan's Br. Sh., t. clxvii. *Natica canrena*, Montagu's Test. Brit., Sup. 148.

The only British Naturalist to whom I am able to refer, for information concerning the *Natica intricata*, is Dr. Fleming, who in his History of British Animals gives the authority of Donovan's British Shells, under the name above given, and to Colonel Montagu, who terms it *N. canrena*; but he adds, "this species has occurred only to Mr. Donovan." And when I add, that Professor E. Forbes (*Malacologia monensis*, p. 62) supposes it to be the same with *N. nitida*, and that it is not to be distinguished from some other foreign species, it will be allowed to be of rare occurrence; and I am therefore led to hope that a description of it, derived from more than one example, and compared with the kindred species *N. glaucina* of about equal size, and both of these with several smaller specimens of each, will be found interesting.

The shell termed by Fleming *N. intricata* has too rarely come within the observation of British Naturalists to have received so many names, as the fancies or mistakes of authors have affixed to the more common species. But to avoid all errors in reference it is necessary to say, that under the name *Natica glaucina* is meant that which by Pennant is denominated *Nerita glaucina*, and it is believed, also by Montagu: by Fleming *Natica glaucina*. Professor Edward Forbes, as quoted above, terms it *Natica monilifera*, from a supposition that it may be the shell so called by Lamarck; and the same is adopted by Macgillivray: (*Molluscosus Animals of Aberdeen &c.*, p. 125.)

In September of the present year (1844) I obtained a specimen of *Natica intricata*, from Penzance, and this I

rangement, as well as in the number of the whorls; which in *N. glaucina* is clearly six, but in *N. intricata* no more than five can be ascertained. In *N. glaucina* the second and the smaller whorls are more inflated, and form a higher spire, the decreasing line of separation having a regular circular sweep; whereas in *N. intricata*, beside that the whole is much more depressed, the spire is not placed in the centre of the whorl, but inclined to the superior side. Another distinguishing mark is the form and situation of the umbilicus; which in *N. glaucina* is a simple ascending cavity, intruded on by a single porcellaneous band, which proceeds from the columella. In *N. intricata* this band is divided so nearly into two, that the connection is only by a narrow slip; and the cleft or separating gap, which in the smaller specimen is rounded and in the larger square, exposes the umbilicus above the columella, and therefore passes directly inward, instead of obliquely upward as in *N. glaucina*. The pillar thus becomes exposed uncovered by the band on one side and the body whorl on the other, in a manner to be highly characteristic of the adult shell. The inferior portion of the band does not stretch fully across to the whorl, but is rounded off by a narrow channel, which proceeds circularly to terminate within a short distance of the aperture: offering, in fact, a broad and smooth porcellaneous separate termination to the pillar.

In colour *N. intricata* is much the most beautiful of English turbinated shells; the two specimens differ much in the depth, though not greatly in the distribution of their tints. In the larger it is far more rich, of a fulvous brown; in the smaller lighter, and of a porcellaneous yellow. The smaller whorls are in the larger somewhat livid; yellow at the separating line: in the larger, a pale yellow; and the beauty of the colouring does not begin above the lower half of the second whorl; from which it descends into four regular lines, at nearly uniform distances, to the margin. These lines are in their ground lighter than the other portions of the surface; and their margins are well defined; they are also portioned out and intersected, with some regularity, by arrow shaped marks; of which those in the two middle are the most regular. The two external lines are the widest, and their arrows broader, and more separate, but that which is nearest the separating line of the whorl most irregular. The line nearest the umbilicus (separated from it however, by a white space) is in the smallest specimen ornamented with regularly formed arrows, but in the larger one side only of this marking appears. The marks here denominated arrows are converging lines closing to a point as they de-

scend, and at this part with more of colour; but they have no middle line; and in the larger specimen their form is much less regular than in the smaller. From the line of separation of the whorls run a considerable number of brown lines, encircling the convexity of the whorls, and uniting the longitudinal lines of arrowy marks, but not actually breaking in on their continuity. The comparative number of these encircling lines, as well as their regularity, is much greater in the larger specimen.

A close inspection of these shells in comparison with a small parcel of *Naticæ*, of about the size of small peas, and which without enquiry I had believed to be all of the more common species, has impressed me with the belief that the *N. intricata* is not so rare as has been supposed; for I found several among them distinguished by the regular lines of arrow shaped marks, and thereby easily separated from others of paler cast, and with only one line of obscure linear marks near the border of the whorl. On further examination I find also on these prettily marked specimens that the spire is less elevated, and possesses the general form already described as belonging to *N. intricata*. But it is remarkable that in the umbilicus and band all these specimens are alike, and resemble *N. glaucina*: a circumstance which does not excite in my mind any doubt of their being of different species, and that those having lines of arrow shaped marks are a young state of *N. intricata*; for I believe that the observation of Professor Forbes may be depended on: that colour in the *Naticæ* is distinctive of species, but at the same time it tends to show that in their younger condition they resemble each other in that which subsequently constitutes their most important difference. In their youthful condition, then, the marking of the body-whorl, and the depressed and

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*The following Synopsis of the GENERA of Zoophytes is arranged so as to assist Persons, unacquainted with the subject, to identify them by considering the external forms only.*



\* *No Polypidom.*

|                                                                                                                         | page.              |
|-------------------------------------------------------------------------------------------------------------------------|--------------------|
| Polypes single, naked, egg shaped, with one circle of tuberculated tentacula, locomotive . . . }                        | HYDRA . . . 136    |
| Polypes single, naked, conoidal, with several circles of retractile tentacula, locomotive . . . }                       | ACTINIA . . . 74   |
| Polypes single, naked, conoidal or columnar, with several circles of partially retractile tentacula, locomotive . . . } | ANTHEA . . . 81    |
| Polypes single, naked, campanulate; tentacula in distant tufts, locomotive . . . }                                      | LUCERNARIA. . . 83 |
| Polypes single, naked, egg-shaped, with scattered filiform tentacula . . . }                                            | CORYNE . . . 11    |
| Polypes single or compound, tentacula irregular, with glandular tips. Polypidom, if present, very imperfect . . . }     | HERMIA. . . 12     |
| Polypes compound, distant, united at their bases by an encrusting trailing band . . . }                                 | ZOANTHUS . . . 73  |
| Polype-mass spongy, covered with stellate depressions . . . }                                                           | ALCYONIUM . . . 58 |

\* \* *With horny Polypidoms, external.*

† *Without cells.*

|                                                                |                        |
|----------------------------------------------------------------|------------------------|
| Polypidoms long, simple tubes, open at the extremities . . . } | TUBULARIA . . . 13     |
| Polypidoms tubular, closed at the extremities . . . }          | FREDERICELLA . . . 135 |

†† *Cells sessile, biserial.*

|                                                                                                        |                    |
|--------------------------------------------------------------------------------------------------------|--------------------|
| Polypidoms arborescent, formed of sub-parallel tubes; cells indistinct, tubular or campanulate . . . } | THOA . . . 15      |
| Polypidoms arborescent, divided into internodes; cells distinct, with everted apertures . . . }        | SERTULARIA. . . 16 |
| Polypidoms arborescent, divided into internodes; cells distinct, imbedded . . . }                      | THUIARIA. . . 27   |

††† *Cells sessile, uniserial.*

|                                                                      |                      |
|----------------------------------------------------------------------|----------------------|
| Polypidoms arborescent, with plumose branches . . . }                | PLUMULARIA. . . 30   |
| Polypidoms arborescent, branches in whorls round the stem. . . . . } | ANTENNULARIA. . . 28 |

†††† *Cells sessile, irregular.*

|                                                                                   |                     |
|-----------------------------------------------------------------------------------|---------------------|
| Polypidoms confervoid; cells in parallel compa- nies, tubular, unilateral . . . } | SERIALARIA . . . 94 |
| Polypidoms confervoid; cells disjoined, ovate, uni- lateral . . . }               | VERICULARIA. . . 94 |
| Polypidoms confervoid; cells irregularly clustered, elliptical . . . . . }        | VALKERIA . . . 95   |



# SYNOPSIS.

## ††††† Cells on ringed footstalks.

|                                                                                                                 |                   |
|-----------------------------------------------------------------------------------------------------------------|-------------------|
| Polypidoms confervoid; cells campanulate; stem jointed, cells rising from thickened parts of the stem . . . . . | LAOMEDEA . . . 37 |
| Polypidoms confervoid; cells campanulate, continuous with the stem, irregular . . . . .                         | CAMPANULARIA: 40  |

## \*\*\* Polypidoms internal.

### † Horny, rooted.

|                                                                            |                   |
|----------------------------------------------------------------------------|-------------------|
| Arborescent, fleshy, warty, with star-shaped depressions, rooted . . . . . | GORGONIA . . . 55 |
|----------------------------------------------------------------------------|-------------------|

### †† Bony, free.

|                                                     |                     |
|-----------------------------------------------------|---------------------|
| Polypidom linear, feathered at one end . . . . .    | PENNATULA . . . 55  |
| Polypidom linear, with curved lines on either side. | VIRGULARIA . . . 55 |

## \*\*\* Polypidoms external, calcareous.

|                                                                                                                |                      |
|----------------------------------------------------------------------------------------------------------------|----------------------|
| Columnar or conical, upper surface lamellated . . . . .                                                        | CARYOPHYLLIA . . 71  |
| Arborescent, or foliaceous, stout; cells immersed, quincuncial, on the upper side only . . . . .               | RETEPORA . . . 130   |
| Arborescent, or foliaceous, cells immersed, quincuncial, oval; cells on all sides . . . . .                    | ESCHARA . . . 131    |
| Arborescent, jointed, cylindrical, cells immersed, quincuncial, rhomboidal; cells on all sides . . . . .       | FARCIMIA . . . 129   |
| Arborescent, cells oval, distinct and irregularly heaped . . . . .                                             | CELLEPORA . . . 109  |
| Arborescent, confervoid, jointed; cells tubular, apertures round, terminal. . . . .                            | CRISIA . . . . 97    |
| Arborescent, confervoid, jointed; cells oblong, apertures opening on one plane . . . . .                       | CELLULARIA . . . 126 |
| Arborescent, confervoid, jointed; cells sub-cylindrical in pairs, apertures lateral and sub-terminal . . . . . | NOTAMIA . . . 100    |
| Polypidoms creeping, cells erect, spatulate, apertures sub-terminal . . . . .                                  | ANGUINARIA . . . 102 |
| Encrusting, cells tubular, of equal diameter, distinct, sometimes ramous . . . . .                             | TUBULIPORA . . . 103 |
| Encrusting, cells tubular, of equal diameter, coalescent. . . . .                                              | DISCOPORA . . . 108  |
| Encrusting, cells elliptical, linked together like beads . . . . .                                             | HYPOTHOA . . . 101   |

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1.2. *Coryna squamata*.  
3. *Hermia glandulosa*.



**Pl. 4.**



*Thuarea articulata.*

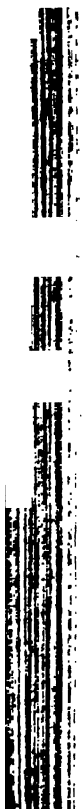
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 4. *Healthcare Services*  
 5. *Medical Research*  
 6. *Healthcare Financing*  
 7. *Medical Education*  
 8. *Healthcare Policy*  
 9. *Medical Ethics*  
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 150. *Healthcare Access*  
 151. *Medical Research Ethics*  
 152. *Healthcare Equity*  
 153. *Medical Ethics*  
 154. *Healthcare Law*  
 155. *Medical History*  
 156. *Healthcare Economics*  
 157. *Medical Sociology*  
 158. *Healthcare Communication*  
 159. *Medical Journalism*  
 160. *Healthcare Management*  
 161. *Medical Innovation*  
 162. *Healthcare Quality*  
 163. *Medical Regulation*  
 164. *Healthcare Reform*  
 165. *Medical Practice*  
 166. *Healthcare Access*  
 167. *Medical Research Ethics*  
 168. *Healthcare Equity*  
 169. *Medical Ethics*  
 170. *Healthcare Law*  
 171. *Medical History*  
 172. *Healthcare Economics*  
 173. *Medical Sociology*  
 174. *Healthcare Communication*  
 175. *Medical Journalism*  
 176. *Healthcare Management*  
 177. *Medical Innovation*  
 178. *Healthcare Quality*  
 179. *Medical Regulation*  
 180. *Healthcare Reform*  
 181. *Medical Practice*  
 182. *Healthcare Access*  
 183. *Medical Research Ethics*  
 184. *Healthcare Equity*  
 185. *Medical Ethics*  
 186. *Healthcare Law*  
 187. *Medical History*  
 188. *Healthcare Economics*  
 189. *Medical Sociology*  
 190. *Healthcare Communication*  
 191. *Medical Journalism*  
 192. *Healthcare Management*  
 193. *Medical Innovation*  
 194. *Healthcare Quality*  
 195. *Medical Regulation*  
 196. *Healthcare Reform*  
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 198. *Healthcare Access*  
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 204. *Healthcare Economics*  
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 207. *Medical Journalism*  
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 210. *Healthcare Quality*  
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 212. *Healthcare Reform*  
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 217. *Medical Ethics*  
 218. *Healthcare Law*  
 219. *Medical History*  
 220. *Healthcare Economics*  
 221. *Medical Sociology*  
 222. *Healthcare Communication*  
 223. *Medical Journalism*  
 224. *Healthcare Management*  
 225. *Medical Innovation*  
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 228. *Healthcare Reform*  
 229. *Medical Practice*  
 230. *Healthcare Access*  
 231. *Medical Research Ethics*  
 232. *Healthcare Equity*  
 233. *Medical Ethics*  
 234. *Healthcare Law*  
 235. *Medical History*  
 236. *Healthcare Economics*  
 237. *Medical Sociology*  
 238. *Healthcare Communication*  
 239. *Medical Journalism*  
 24

**Abstract**



*Thuia Thuia.*





Pl. 6.



*Sertularia nigra.* -

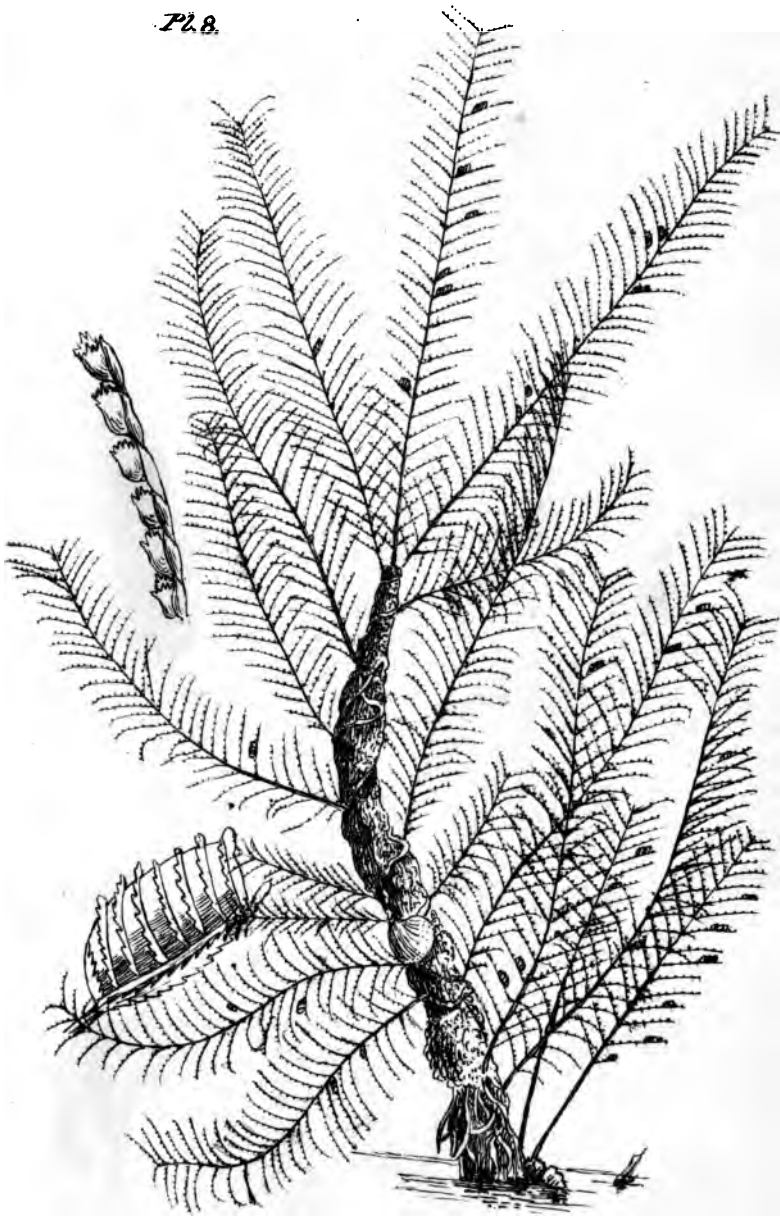
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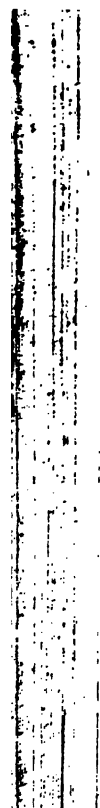
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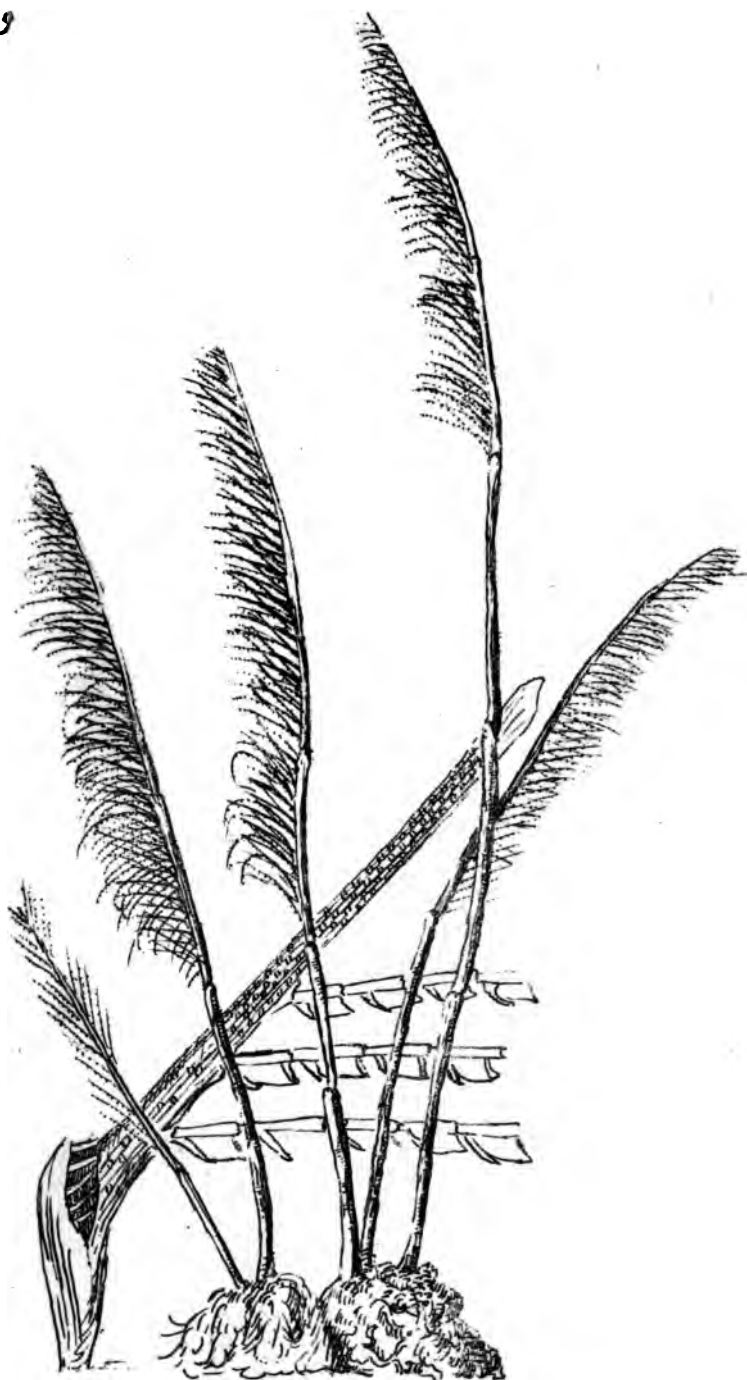
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P28.



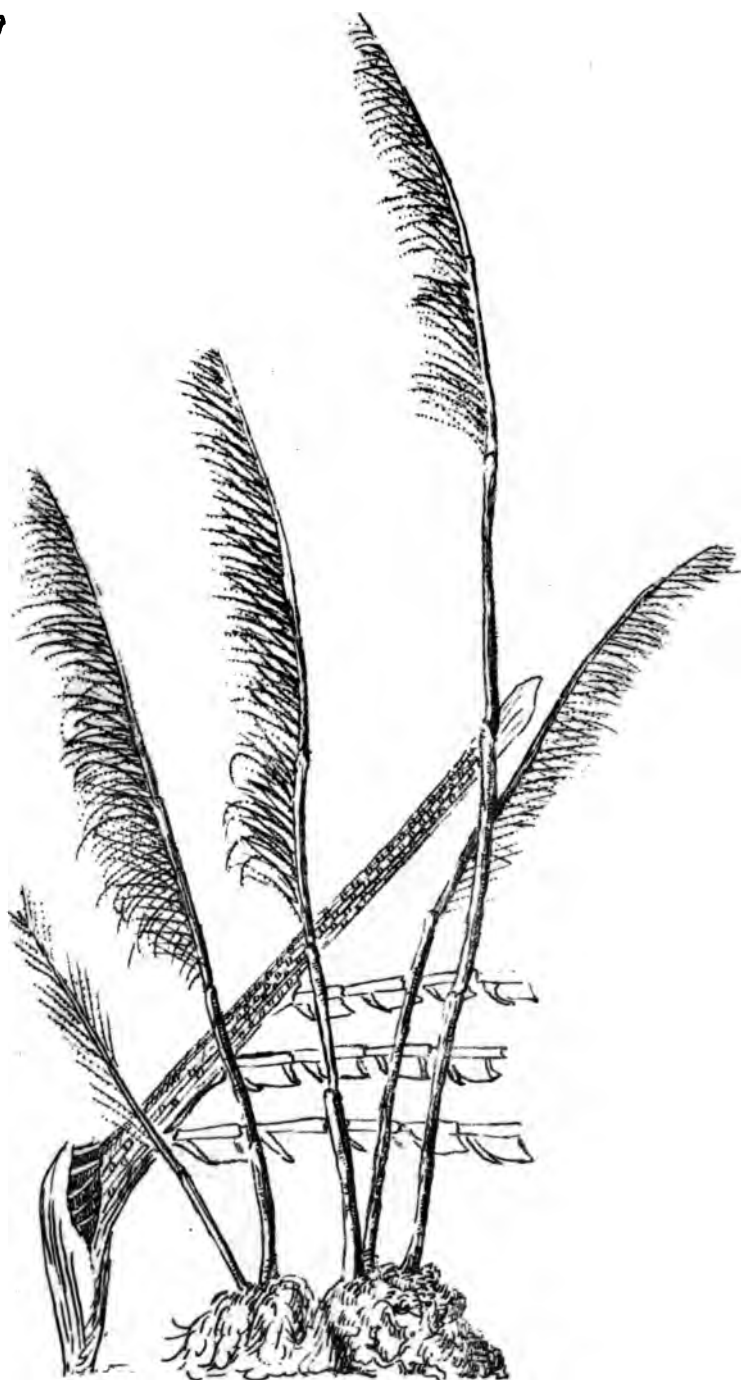
*Plumularia Cristata.*





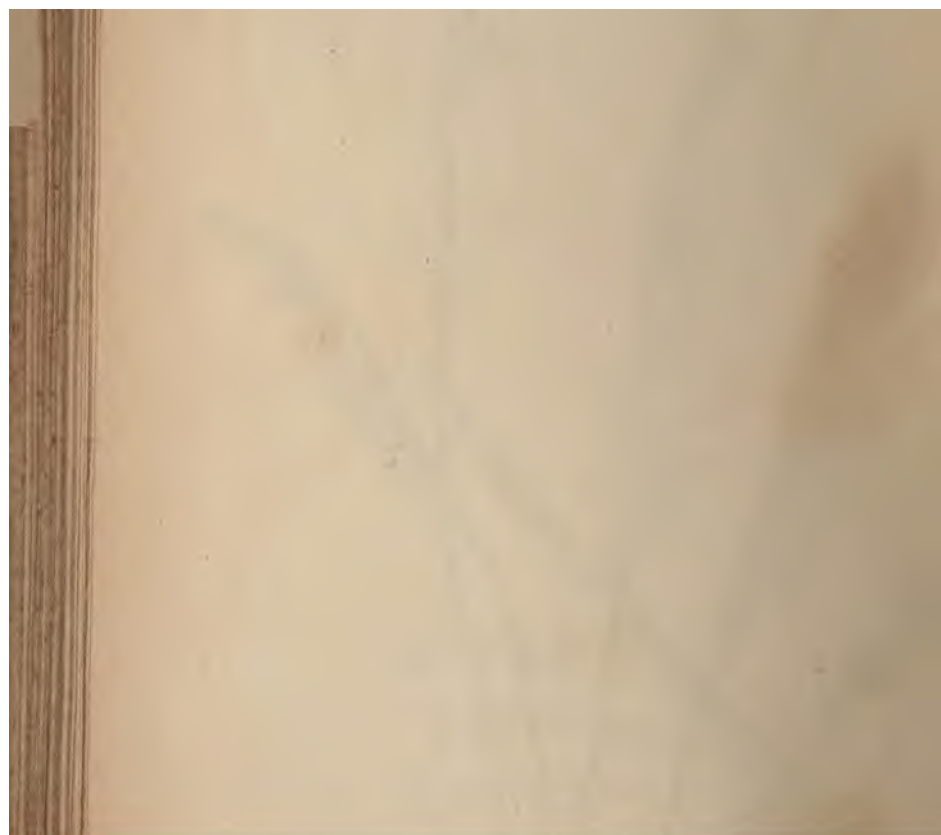
*Plum. Myriophyllum.*

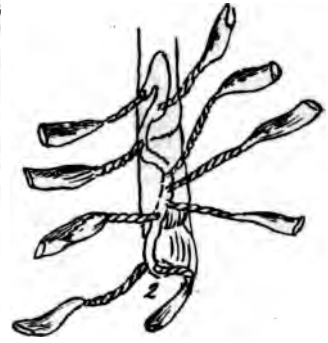
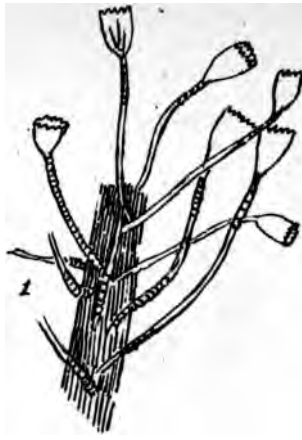




*Plum. Myriophyllum.*



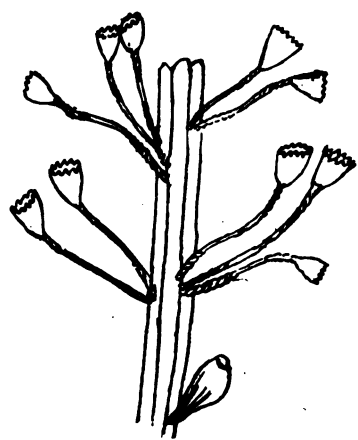




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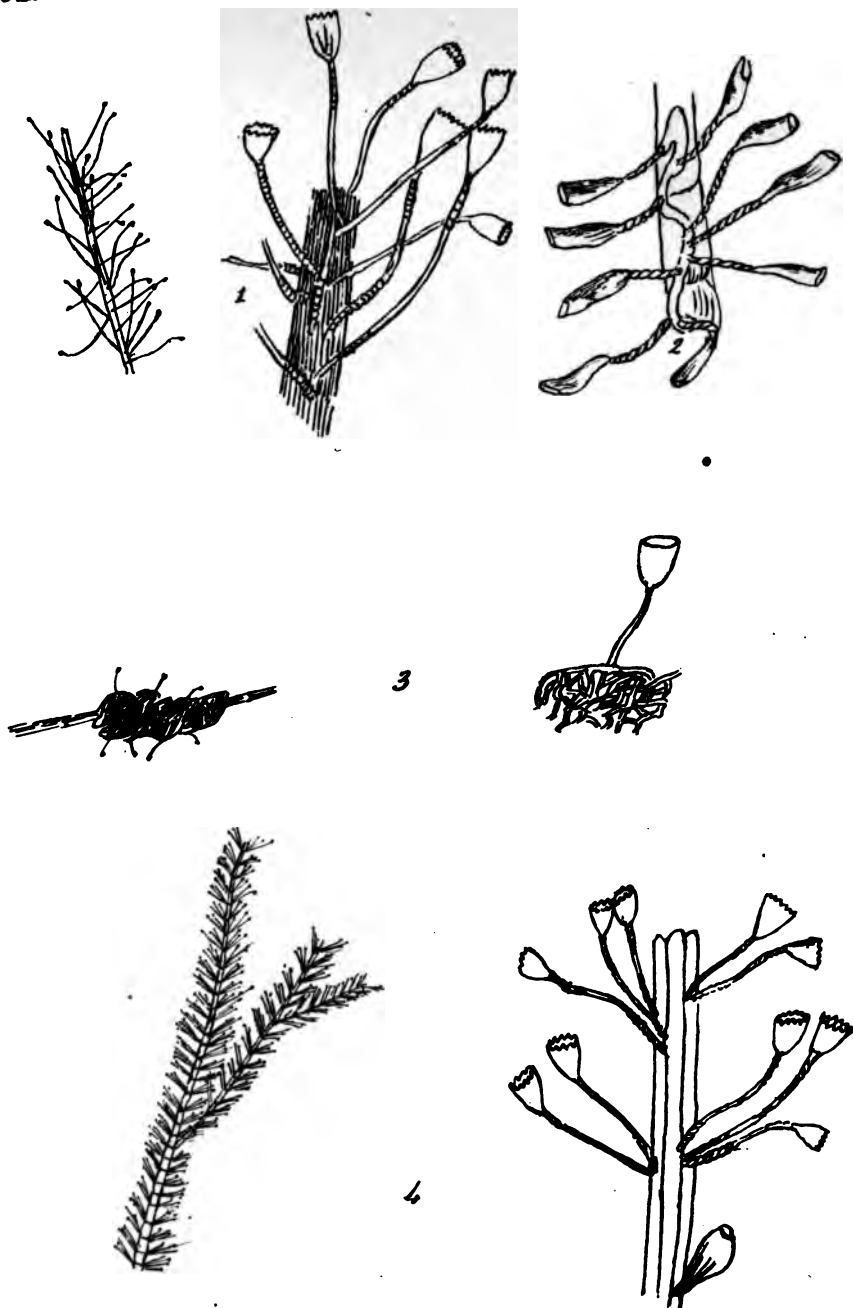


4



- 1 *Campanularia Volubilis*
- 2 *C. Dumosa*
- 3 *C. Intertexta*
- 4 *C. Verticillata*





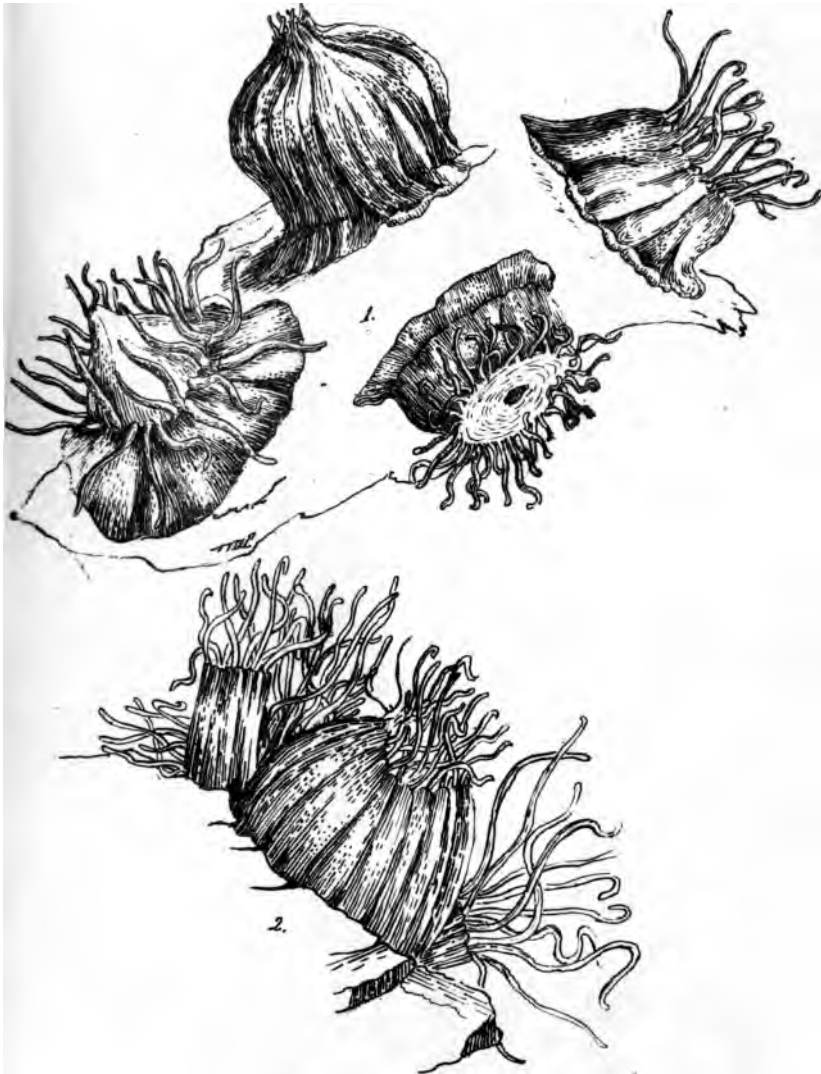
1 *Campanularia Volubilis*  
 2 *C. Dumosa*  
 3 *C. Intertexta*  
 4 *C. Verticillata*





1. *Sergesia verrucosa*
2. .... *Placoma*
3. *Laryophyllia Smithii*

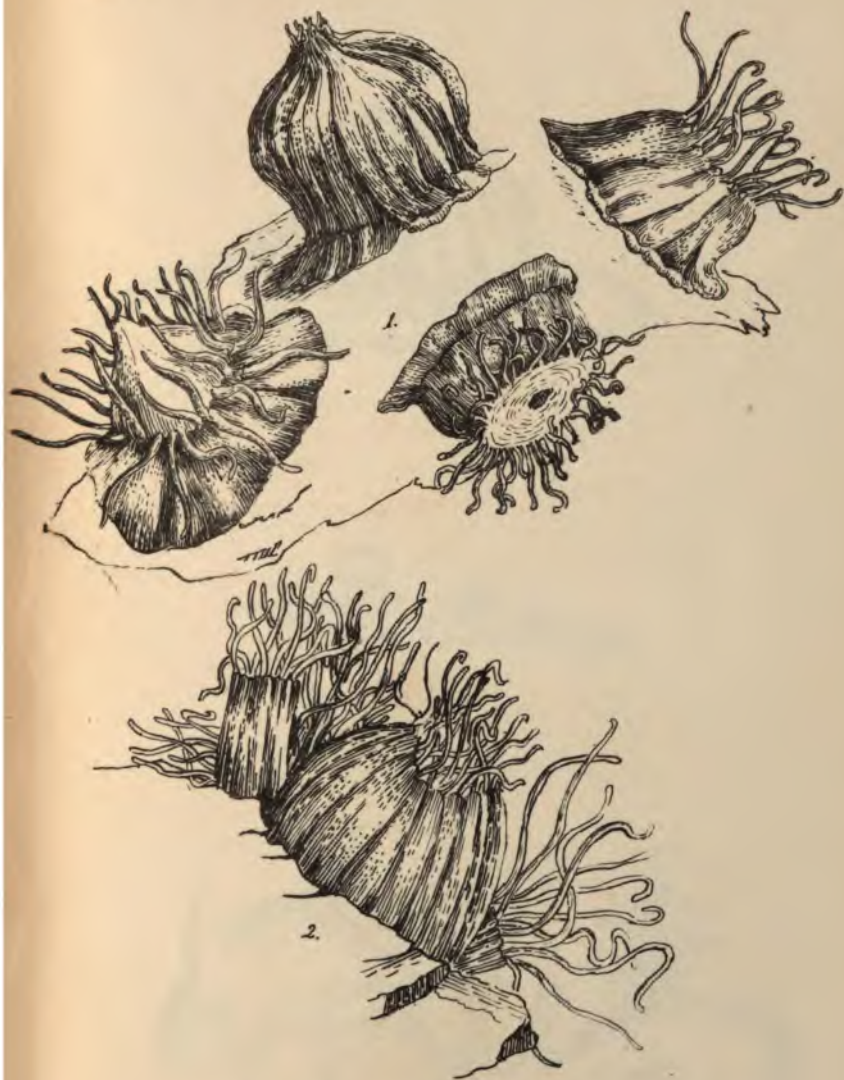
1. The first part of the document is a list of names and dates, which appears to be a record of some kind. The names are written in a cursive script, and the dates are in a more formal, printed style. The list is organized into two columns, with names on the left and dates on the right. The names are: John Smith, James Brown, William Jones, and Thomas White. The dates are: 1790, 1791, 1792, and 1793. The list is followed by a section of text that is also written in cursive. This text appears to be a description of the events that took place during the period covered by the list. It mentions the names of the individuals listed and describes their actions and the circumstances surrounding them. The text is written in a clear, legible hand, and it is organized into paragraphs. The first paragraph describes the events of 1790, the second paragraph describes the events of 1791, the third paragraph describes the events of 1792, and the fourth paragraph describes the events of 1793. The text is followed by a final section of text that appears to be a summary or conclusion. This text is also written in cursive and is organized into a single paragraph. It summarizes the events of the period and provides a final assessment of the situation. The document is a historical record of events, and it is written in a clear, legible hand. It is organized into sections and paragraphs, and it provides a detailed account of the events that took place during the period covered by the list.



1. *Actinia Mesembryanthemum.*  
2. *Anthrea Boreus.*







1. *Actinia Mesembryanthemum*.  
2. *Anthura Cereus*.



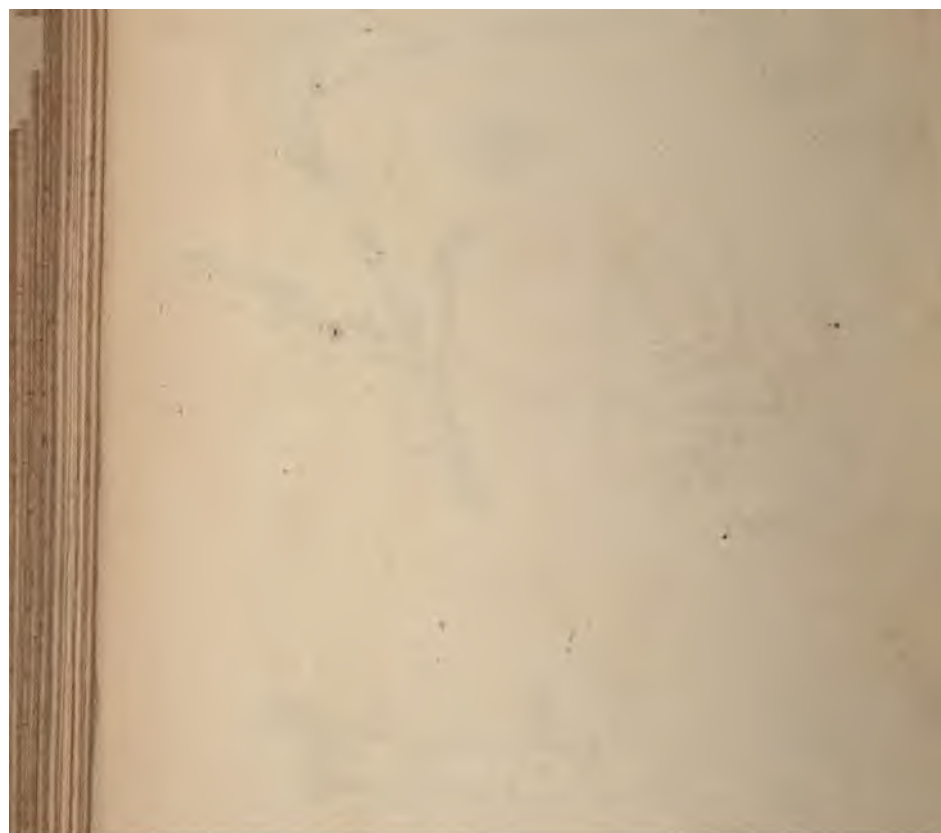


1.2. *Actinia Parasitica*.  
3. *Doanthis Couchii*.

1. The first step in the process is to identify the problem or issue that needs to be addressed. This involves gathering information and understanding the context of the problem.



- 1 *Lucernaria auricula*  
 2.3. Mouth and foot  
 4 *Seriataria dendigera*  
 5 *Vulkaria urva*





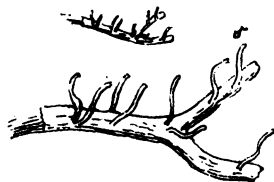
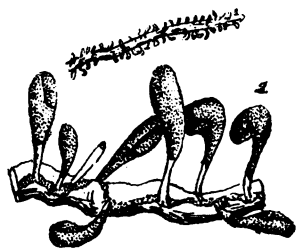
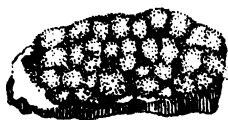


- 1 *Vesicularia spinosa.*
- 2 *Valeria imbricata*
- 3 *Valeria cuscuta.*
- 4 *Crisia cornuta.*





Pl. 19.



1 *Discipora hispida*

2 *Anguin<sup>a</sup> spatulata*

3 *Tubul. trahens*

4 *Sub. Deflexa.*

5 *Sub. trahens.*

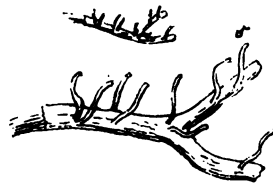
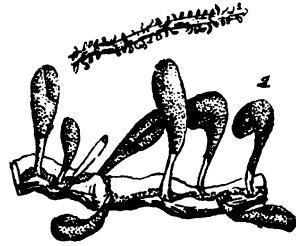
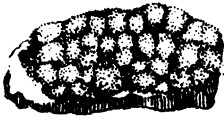
6 *Sub. Serpens*

7 *Sub. Phalangea*

8 *Hippothoa Fica.*



Pl. 19.



1 *Discopora hispida*

2 *Anguin. spatulata*

3 *Tubul. trahens*

4 *Sub. Deflexa.*

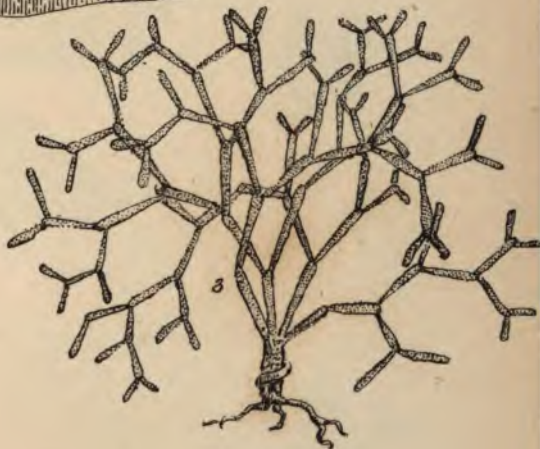
5 *Sub. trahens.*

6 *Sub. Serpens*

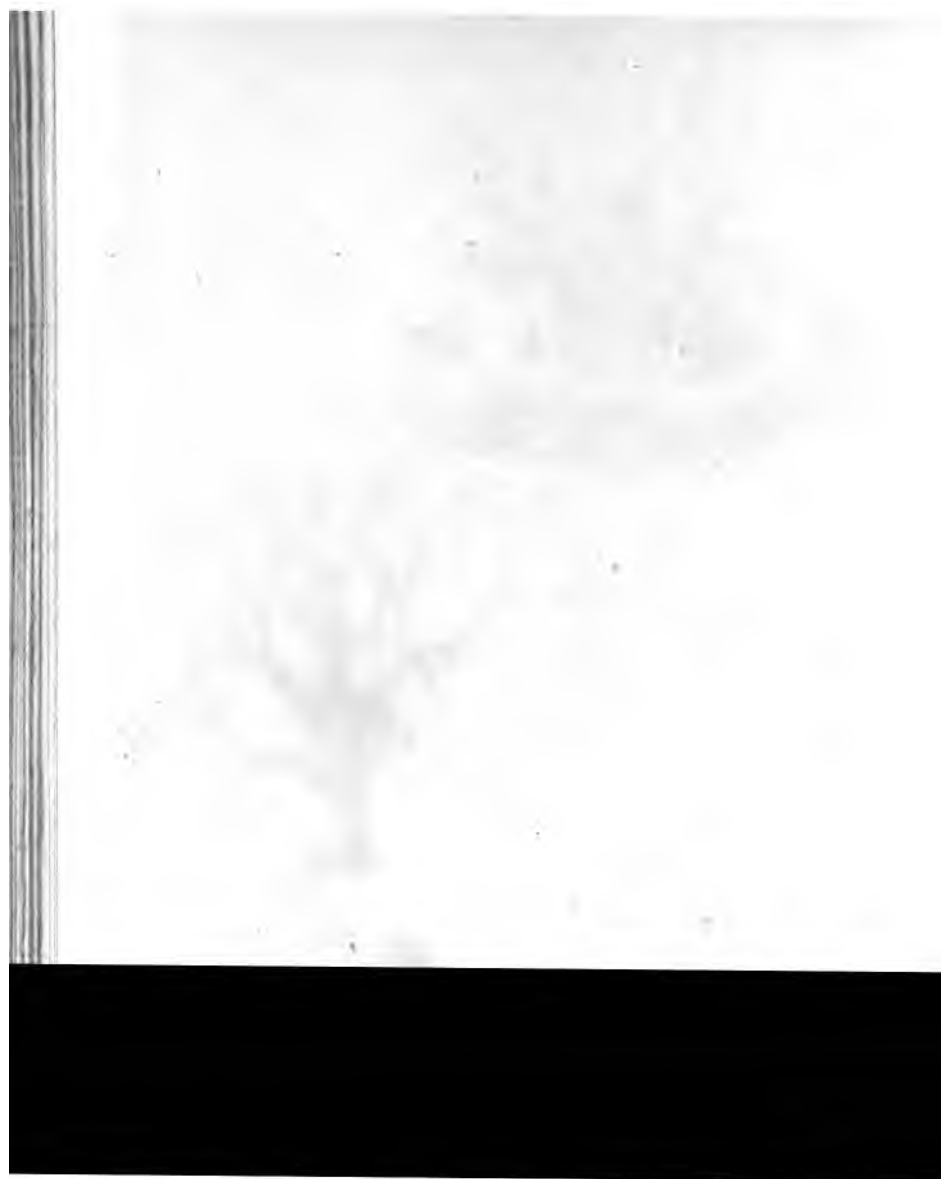
7 *Sub. Phalangea*

8 *Hippothoa Fica.*

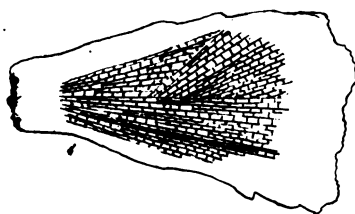




1. *Cllepora Cervicornis*.  
 2. *C. Ramulosa*.  
 3. *Farcimia Salicornia*.  
 4. 5. *Col. Punicosa*.



Pl. 21.



2.

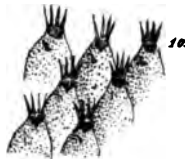
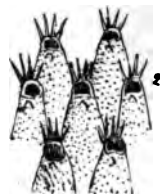
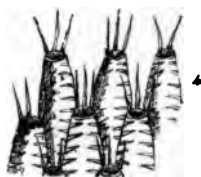


1. *Hustra foliacea*.

2. *S. Membranacea*.



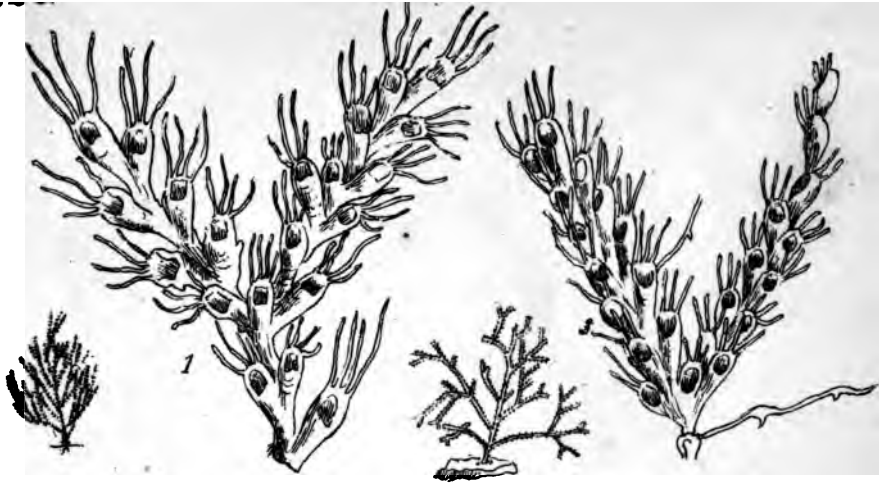




*C. Vitrina.*

- |   |                           |    |                            |
|---|---------------------------|----|----------------------------|
| 2 | <i>Lepralia Pustulata</i> | 9  | <i>Lepralia Reticulata</i> |
| 3 | <i>L. Nitida</i>          | 10 | <i>L. Libala</i>           |
| 4 | <i>L. Innominala</i>      | 11 | <i>L. Insignis</i>         |
| 5 | <i>L. Tridensata</i>      | 12 | <i>Membranipora Pilosa</i> |
| 6 | <i>L. Variolosa</i>       | 13 | <i>M. Prachii</i>          |
| 7 | <i>L. Vinca</i>           | 14 | <i>Lep. Pedicostoma</i>    |
| 8 | <i>L. Fenestralis</i>     | 15 | <i>L. Lustra lineata</i>   |





1 *Cellularia ciliata*. 3 *C. Reptans*

2 *C. Scruposa*. 4 *C. Plumosa*.













